



EVALUATION OF UTILIZATION PATTERNS OF PHYSICIANS'
PRACTICE ARRANGEMENTS

Contract No. 282-83-0070

Task Assignment Number 3

Final Report

January 1985

EXECUTIVE SUMMARY

AND

VOLUME I

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PREFACE

This project was conducted by Applied Management Sciences (AMS), who collected the data, and by Harold S. Luft, Deborah W. Garnick, and Sandra S. Hunt of the Institute for Health Policy Studies, University of California, San Francisco (IHPS), who performed the data analysis.

This project was funded by the Office of the Assistant Secretary for Planning and Evaluation, DHHS, in order to evaluate the premise that the group practice model may be conducive to efficiency in medical practice. Three types of physician practice settings, fee-for-service multi-specialty group practices (FFS), prepaid group practice HMOs (PGP), and independent practice association HMOs (IPA), are examined to determine whether previously reported efficiencies in group practices result from financial incentives of prepaid capitation or from a style of practice common to groups of physicians. The focus of attention is on whether physicians in different practice settings treat patients with the same medical problems using different resources.

Along with a panel of advisors both within and outside the Federal government, AMS selected sites for study, identified six diagnoses, designed case-study interview forms and medical records coding instruments, and conducted case-study interviews; directed data collection, and created a computer tape of the data. AMS also wrote up case-study reports for each of the 14 sites. Researchers at IHPS further corrected errors in variable creation, analyzed the data, and outlined directions for future research. The sections of this final report prepared by AMS and by IHPS are indicated in the Table of Contents.

The authors wish to acknowledge the valuable contributions of the Project Officer, Sharman Stephens, as well as Stephen McPhee, Bonnie Lefkowitz, Beth McGlynn, and John Drabek. In addition, useful insights into research design and analysis were provided by Stephen Shortell and Louis Goodman, who served as consultants to this project.

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EXECUTIVE SUMMARY

Federal policy encouraging and supporting the development of health maintenance organizations (HMOs) has been based upon research findings which suggest that HMOs provide services at a cost substantially less than traditional fee-for-service practitioners. However, the effect of HMOs on costs and utilization of health services has not yet been conclusively demonstrated. Self-selection of enrollees or of HMO physicians with different characteristics (e.g., health status, age, race) or "tastes" for medical care styles and/or other factors may account for the observed lower costs and utilization of medical services. If this is the case, then expanding HMO market shares will not reduce overall costs and utilization of services, but merely segment the market into those with less expensive care and those individuals preferring more expensive medical care styles.

This project was formulated to examine a number of factors that were thought to contribute to the performance of HMOs, and then compare the performance of representative, operational plans to multi-specialty fee-for-service group practices operating in the same market areas. This approach was taken in order to shed light not only on the effects of the "group practice" of medicine, but also on the effects of incentives and organizational structure within the "multi-specialty group" mode of practice. Further, in order to examine the principal modalities of HMOs, both prepaid groups (PPGs) and individual practice association (IPA) HMOs were studied.

As such, the primary objectives of this study were to: (1) examine patterns of use of particular services and a composite standardized utilization measure of health services provided by PPGs, IPAs, and multi-specialty fee-for-service group practices for selected diagnoses; (2) investigate the effect of financial incentives and organizational arrangements on utilization of health services; and (3) consider other factors which may influence the delivery of health services through each of these practice arrangements.

The project was carried out in three phases. First, Applied Management Sciences, Inc. (AMS), developed a plan for collecting data for the project. Second, AMS carried out data collection, coding and preparation of research files. Third, the data was analyzed by Harold Luft, Deborah Garnick, and Sandra Hunt of the Institute for Health Policy Studies, University of California, San Francisco.

The site selection criteria work resulted in specifications for choosing one each of the three practice types of interest (i.e., PGP-HMO, IPA-HMO, and multi-specialty FFS group practice) in each of five geographically dispersed market areas.

Six diagnoses were studied at each practice. These diagnoses complied with a series of selection criteria that included: frequently observed in ambulatory settings; a well-defined occurrence; allowing for a range of medically acceptable diagnostic procedures and treatment(s); and, encompassing a range of chronic conditions, short-term acute ambulatory, and acute inpatient treatments:

1. Pediatric Asthma
2. Duodenal Ulcer
3. Uterine Bleeding (non-specific)
4. Acute Otitis Media
5. Cholecystitis
6. Maternity Care

The data collection phase of the project encompassed the following activities:

- o securing participation agreements from study practices;
- o visiting study practices to obtain practice characteristics information and to collect utilization (i.e., treatment) data;
- o converting the data collected into machine-readable form;
- o producing various tabular presentations of the data to guide the analysis activities; and
- o preparing case study reports for each of the practices visited.

A number of practices were identified by the project staff (with active involvement of the Medical Group Management Association) that satisfied project objectives. Members of AMS's staff visited the practices to interview senior members of the organization to obtain information on the practice characteristics, history, structure, relationships, etc. Local representatives of the American Medical Records Association also visited each site to collect treatment data for 30 patients in each of the six study diagnoses. Treatment data were obtained by reviewing patient medical records and completing an abstracting instrument.

Applied Management Sciences' project staff summarized and then transferred the treatment data to data entry forms. The data were summarized in order to collapse the entire course of treatment to a discrete number of events (e.g., number of limited visits to an internist, number of radiologic procedures performed, number of inpatient laboratory tests performed). The summarized data were transferred to a data entry form to make the information machine readable.

The organizational characteristics information collected were used to prepare case study reports for each of the practices included in the project. The organizational characteristics were also included in the analysis file (automated), and thus will be available for use in analyzing the utilization data.

The analysis of the data was conducted in three parts. First, raw data were used to examine utilization of services for each diagnosis across all 14 sites and by practice type, region, and organizational characteristics. Next, patient age, sex, and region were held constant to explore whether case mix or regional style of care might explain utilization differences. Finally, utilization was examined across all six diagnoses to identify practices or types of practices that can be characterized in terms of high or low average utilization of services.

This project has demonstrated that clear differences exist in utilization of specifically identified services across practice sites. While most previous studies have been focused on differences in total costs or overall utilization across various practice arrangements, specific

services linked to specific diagnoses have been measured in this study. Even though there was a maximum of only 30 patients with each diagnosis at each practice site, significant differences in utilization across sites have been shown for 37 out of 48 measures of utilization. Generally, the services for which differences across sites are insignificant are of low frequency, e.g., X-rays for pregnant patients. Before the analysis, there was little reason to believe that 30 patients would be enough to detect significant differences across sites.

In addition to practice setting and organizational factors, there are numerous explanations for these observed differences among practice sites. First, patients at some sites may be more severely ill than patients at other sites. For example, more potentially complicated cases might be seen at some sites because of the availability of certain specialists. Alternatively, severely ill patients may be referred-out of some practices to be treated by specialists. Second, sites may differ in reporting utilization. For example, some sites may systematically fail to report procedures, such as laboratory tests, on the patients' office medical records.

Several practice sites were identified as high or low average utilizers of services across a range of six quite different diagnoses. Not only are some practice sites using many resources to treat one diagnosis, but utilization is high across the board. These patterns of high or low utilization across diagnoses are more clear for general ambulatory care than for total utilization including hospital admissions and specialized services.

In some cases, these patterns fit prior expectations. For example, FFS practices are generally high utilizers of ambulatory care except for pregnancy. However, physician care during pregnancy and delivery often is paid at a global fee, even in FFS practices. Therefore, physicians in these practices do not face the same financial incentives for pregnant patients as for patients with other diagnoses. The fact that pregnant patients in PGPs are, on average, medium or high users of services compared with those in IPA or FFS practices, also might be explained by the use of lower paid nurses or nurse-midwives in PGPs who may make possible more frequent visits.

One goal of this study was to identify factors which explain utilization levels other than the classification of practices such as IPAs, FFSs or PGPs. For example, one reason PGPs are thought to have lower utilization compared to FFS practices is because of centralized decisionmaking or structured utilization review. In this study, efforts were made to evaluate decisionmaking and utilization review as separate from the organizational arrangement such as a PGP or FFS practice. This goal was only partially realized.

While a few patterns of utilization according to organizational categories were noted, the results were usually statistically insignificant. Patterns of ambulatory care utilization were found for centralization of decisionmaking and financial incentives. Highly centralized decisionmaking was not associated with lower utilization. This association may be expected if the organizational structure acts to set strict utilization standards. However, the effects of centralized decisionmaking also depend on the goals of the organization. When financial incentives of the group and of individual physicians are to increase utilization, generally high ambulatory care utilization is found. Patterns of total utilization were found for peer interaction/quality assurance and financial incentives. For low peer interaction/quality assurance, as well as for the case when both individual physician and group incentives are to constrain utilization, total utilization is generally high. Thus, for financial incentives, opposite results are found for ambulatory and for total utilization.

While these results show some utilization differences by organizational factors, the differences often are not statistically significant. So, caution must be exercised in drawing broad implications from these findings. Organizational forms is inappropriate given the small, non-random sample.

Several findings, however, are worth underscoring. First, with the rather blunt instruments available, differences across sites could be detected for these largely ambulatory care conditions. This suggests that the variations in surgical and hospital use identified by Wennberg and others are also occurring in ambulatory care. Second, more than half the sites exhibited reasonably consistent practice patterns across all the

diagnoses. This suggests that it may be possible to develop a set of tracer conditions that could be used to represent overall practice patterns. While it is premature to reach such a conclusion, the findings are encouraging. If a set of tracers were developed, they could be used by insurers or Medicaid programs in selecting efficient plans for contracting purposes.

The findings with respect to practice type are both reassuring and surprising. The fee-for-service settings were generally high utilizers of ambulatory services, except for maternity care. This is consistent with theoretical expectations, and supports the notion that increased use of global fees for physician services might produce cost savings even in the absence of major organizational modifications. Perhaps most surprising were the generally high utilization rates for the prepaid group practices compared to IPAs or FFSs. This may be a result of different case mix. For example, PGP physicians may use more stringent criteria in assigning a diagnosis, so their patients in our sample may be more severely ill.

It must also be remembered that most of the work indicating lower utilization in PGPs is population, (or enrollment) rather than patient based. The comparison is usually with open-ended insurance and independent fee-for-service practitioners, rather than multispecialty group practices (our FFS sites) or IPAs. Finally, the vast majority of the published studies showing lower use for PGP enrollees focuses on the large, mature HMOs such as Kaiser-Portland or Group Health Cooperative. Our PGP sites do not include such large mature plans, and the difference in findings may suggest that the earlier results are not generalizable to all PGPs. It is also important to recall that in most previous studies, prepaid group practices were compared with independent fee-for-service practitioners. Our comparisons are among PGPs, FFS groups, and IPAs. It may be the case that all three forms are low utilizers relative to independent fee-for-service practice, but that comparison was not feasible because of difficulties in data collection. With the insights of this study into the possibilities and pitfalls of practice pattern analyses, future studies may help resolve the remaining questions.

CHAPTER 1

INTRODUCTION

Federal policy encouraging and supporting the development of health maintenance organizations (HMOs) has been based upon research findings which suggest that HMOs provide services at a cost substantially less than traditional fee-for-service practitioners. However, the effect of HMOs on costs and utilization of health services has not yet been conclusively demonstrated. Self-selection of enrollees or of HMO physicians with different characteristics (e.g., health status, age, race) or "tastes" for medical care styles and/or other factors may account for the observed lower costs and utilization of medical services. If this is the case, then expanding HMO market shares will not reduce overall costs and utilization of services, but merely segment the market into those with less expensive care and those individuals preferring more expensive medical care styles.

This project was formulated to examine a number of factors that were thought to contribute to the performance of HMOs, and then compare the performance of representative, operational plans to multi-specialty fee-for-service group practices operating in the same market areas. This approach was taken in order to shed light not only on the effects of the "group practice" of medicine, but also on the effects of incentives and organizational structure within the "multi-specialty group" mode of practice. Further, in order to examine the principal modalities of HMOs, both prepaid groups (PPGs) and individual practice association (IPA) HMOs were studied.

As such, the primary objectives of this study were to: (1) examine patterns of use of particular services and a composite standardized utilization measure of health services provided by PPGs, IPAs, and multi-specialty fee-for-service group practices for selected diagnoses; (2) investigate the effect of financial incentives and organizational

arrangements on utilization of health services; and (3) consider other factors which may influence the delivery of health services through each of these practice arrangements.

OVERVIEW OF THE PROJECT

The project was carried out in three phases. First, Applied Management Sciences, Inc. (AMS), developed a plan for collecting data for the project. Second, AMS carried out data collection, coding and preparation of research files. Third, the data was analyzed by Harold Luft, Deborah Garnick, and Sandra Hunt of the Institute for Health Policy Studies, University of California, San Francisco.

Research Design

The research design phase of this project encompassed the following activities:

- o description of the typologies of group practices to be studied;
- o development of a set of hypotheses on the expected effect of organizational, professional, and financial variables on utilization and cost of services provided, within each of the practice arrangements studied;
- o development of a set of site selection criteria and selection of sites for participation in the study;
- o selection of six diagnoses for study and preparation of a medical record abstracting protocol;
- o development of (and seeking forms clearance from the Office of Management and Budget) survey instruments for obtaining data on the organizational, financial, patient, and physician characteristics of each group practice;
- o preparation of an analysis plan; and
- o examination of the methodological strengths and weaknesses of the research design.

The site selection criteria work resulted in specifications for choosing one each of the three practice types of interest (i.e., PGP-HMO, IPA-HMO, and multi-specialty FFS group practice) in each of five geographically dispersed market areas. In order to ensure the anonymity of the practices studied, throughout this report the practices will be referred to by their practice type (i.e., PGP, IPA, and FFS) and their approximate location (i.e., Pacific, West, Midwest, Central, and Atlantic) rather than by name.

Six diagnoses were studied at each practice. These diagnoses complied with a series of selection criteria that included: frequently observed in ambulatory settings; a well-defined occurrence; allowing for a range of medically acceptable diagnostic procedures and treatment(s); and, encompassing a range of chronic conditions, short-term acute ambulatory, and acute inpatient treatments. After considerable consultation with the project advisors, the Project Officer, and Ms. Rita Finnegan, Executive Director of the American Medical Records Association, the following diagnoses were selected:

1. Pediatric Asthma
2. Duodenal Ulcer
3. Uterine Bleeding (non-specific)
4. Acute Otitis Media
5. Cholecystitis
6. Maternity Care

Instruments were prepared for collecting diagnostic-specific information and data on the characteristics of the study practices. The instruments were submitted to the Office of Management and Budget for Forms Clearance. Receipt of OMB clearance concluded the research design phase of the project.

Data Collection

The data collection phase of the project encompassed the following activities:

- o securing participation agreements from study practices;
- o visiting study practices to obtain practice characteristics information and to collect utilization (i.e., treatment) data;
- o converting the data collected into machine-readable form;
- o producing various tabular presentations of the data to guide the analysis activities; and
- o preparing case study reports for each of the practices visited.

A number of practices were identified by the project staff (with active involvement of the Medical Group Management Association) that satisfied project objectives. Upon securing approval from the Project Officer for inclusion of specific practices in the study, MGMA contacted the practices and obtained participation agreements. Two teams of personnel then visited each practice. Members of AMS's staff visited the practices to interview senior members of the organization to obtain information on the practice characteristics, history, structure, relationships, etc. Local representatives of the American Medical Records Association also visited each site to collect treatment data for 30 patients in each of the six study diagnoses. Treatment data were obtained by reviewing patient medical records and completing an abstracting instrument.

Applied Management Sciences' project staff summarized and then transferred the treatment data to data entry forms. The data were summarized in order to collapse the entire course of treatment to a discrete number of events (e.g., number of limited visits to an internist, number of radiologic procedures performed, number of inpatient laboratory tests performed). The summarized data were transferred to a data entry form to make the information machine readable.

The organizational characteristics information collected were used to prepare case study reports for each of the practices included in the project. The organizational characteristics were also included in the analysis file (automated), and thus will be available for use in analyzing the utilization data.

Analysis

The analysis of the data was conducted in three parts. First, raw data were used to examine utilization of services for each diagnosis across all 14 sites and by practice type, region, and organizational characteristics. Next, patient age, sex, and region were held constant to explore whether case mix or regional style of care might explain utilization differences. Finally, utilization was examined across all six diagnoses to identify practices or types of practices that can be characterized in terms of high or low average utilization of services.

FINAL REPORT ORGANIZATION

This report summarizes the results of the project activities conducted during all three phases of the project. The report is organized into the three volumes which include the following chapters. Authorship is indicated in parentheses.

Volume I

- o Chapter 2: Previous Research (AMS)
- o Chapter 3: Site Selection (AMS)
- o Chapter 4: Diagnosis Selection and Medical Records Abstracting (AMS)
- o Chapter 5: Research Design (IHPS and AMS)
- o Chapter 6: Classification of Practice Sites (IHPS and AMS)
- o Chapter 7: Results and Diagnosis Specific Analyses of Utilization (IHPS)
- o Chapter 8: Cross Diagnosis Results (IHPS)
- o Chapter 9: Summary of Results and Design and Implementation of Future Studies (IHPS)

Volume II

- o Chapter 10: Case Studies (AMS)

Volume III

- o Data Collection Instruments (AMS)

CHAPTER 2

PREVIOUS RESEARCH

As background for this project, Applied Management Sciences staff conducted a brief review of the research which relates to costs and utilization of services provided through alternative physicians' practice arrangements. The focuses of this review were to seek information on: (1) the effect of the group practice form on costs and utilization of services; and (2) the effect of the payment mechanism. This chapter summarizes the results of the review of the literature. It is emphasized that the literature search and review were not comprehensive. Consequently, there are likely to be omissions recognized by the reader of this Report.

2.1 FEDERAL POLICY AND HEALTH MAINTENANCE ORGANIZATIONS

Rapidly rising health expenditures and inflation in health care prices created a situation where policy makers' attention was directed to HMOs as a potential solution to these problems. The Health Maintenance Organization Act of 1973 (P.L. 93-22) was passed with the intent to facilitate the expansion of HMOs into more markets. This act contained provisions to exempt federally qualified HMOs from state laws which presented barriers to their development. In addition, employers with 25 or more employees were required under P.L. 93-22 to offer a federally qualified HMO as an option to existing employment-based insurance plans, if such an HMO existed in the employment area.

Growth of HMOs has been rapid during the past decade. As of June 30, 1980, there were 236 prepaid health plans in the U.S. providing services to a total enrollment of over 9 million people. However, the geographic distribution of HMOs remains uneven, with over 58 percent of all HMO membership concentrated in the West by 1980, and 12 states with no HMO offering services.

2.2 TYPOLOGIES OF PHYSICIANS' PRACTICE ARRANGEMENTS

There is a wide range of diversity among HMOs. The type and structure of the HMO is important because of the incentives created for the physician-provider and the implications for the extent of competition among HMOs and with the traditional insurance/fee-for-service delivery system. Luft (1981) lists the following characteristics which account for variations among HMOs:

- Method of paying the physician: HMOs may choose to pay physicians with a fixed salary, by capitation, or on a fee-for-service basis.
- Practice setting: HMO services may be provided at a single site or they may be dispersed over a large number of sites.
- The defined enrollee population: Operating HMOs vary in size from 3,000 to over 1,000,000 enrollees. In some cases, enrollees are composed of homogenous populations ranging from university faculty and staff, on one hand, to Medicaid recipients, on the other hand. In other cases, HMOs enroll a rather broad cross-section of the community. The geographic base of enrollment may be concentrated in a single town or widely dispersed throughout an entire region. The fact that an HMO treats a defined population on a prepaid basis does not preclude it from also treating individual patients on a fee-for-service basis. Thus, some organizations have mixed prepaid (HMO) and fee-for-service patient populations.
- Fixed payment per HMO enrollee: The fixed payment per enrollee also can vary considerably for several reasons, including the use of copayments to varying degrees, and the scope of services offered under different HMO benefits packages.

Luft classifies HMOs into three basic models:

- Staff Model: In a staff model HMO, the physicians are employed directly by the health plan or by a related organization. For instance, in some county-sponsored plans, the physicians may be employees of the county rather than of the HMO.

- Group Model: In a group model plan, physicians are members of a medical partnership or corporation which, in turn, contracts with the HMO to provide physician services.
- Individual Practice Associations: Individual practice association model HMOs usually involve a relatively large number of independent physicians or physician groups who draw only a minority of their patients from the HMO. The contractual agreement typically specifies fee levels and risk-sharing by the physicians. For competitive marketing purposes, an HMO may, in some cases, constitute itself as an individual practice association for purposes of federal qualification in order to avoid designation as a group or staff model.

Wolinsky (1980) classifies HMOs into eight different types based upon:

- whether the HMO owns a hospital, which serves only HMO subscribers;
- arrangements with physician participants
 - salaried staff of HMO
 - salaried group practice of HMO
 - group practice legally separate from HMO
 - one group practice contracting with HMO while maintaining a private group practice
 - several established group practices independently contracting their services to the HMO while maintaining their private group practices
 - fee-for-service practitioners who contract individually to service HMO subscribers while maintaining their private practice for other patients
 - fee-for-service practitioners who contract through a separate legal entity to serve HMO subscribers while maintaining their private practices for other patients.

The characteristics of fee-for-service medical groups that distinguish several categories of groups include (AMA, 1981):

- type of group (i.e., single specialty or multispecialty)
- form of organization
 - Sole proprietorship, employing other physicians. The management, delegation of authority, and financial policy are dictated solely by the owner, and the group is only as permanent as the owner.
 - Partnership, between two or more physicians to share their profits and losses in an unincorporated business. Each partner is legal agent and can bind the other by his/her acts, including negligence.

- Professional Corporation, a legal entity set up to function in the business world distinct from its several members. Liability for corporate debts is usually limited to the contributed capital and other corporate property. The corporation has continuity of life, centralized management, and transferability of interests.
- Association, neither a corporation nor a partnership, includes some of the desirable features of a corporation (centralized management, continuity of organization, and continuity of life) while excluding the undesirable mutual agency of partners.
- Foundations, nonstock, nonprofit corporations organized under state law, for charitable, scientific, philanthropic, religious, or educational purposes. Management is centralized in a board of directors and officers.
- Method of income distribution
 - salary, plus a share of net income
 - equal distribution
 - straight salary
 - expense sharing
- Ownership and location of group facilities
 - not owned
 - owned, through a separate organization
 - owned, through the group
 - hospital-based
 - hospital contiguous
 - neither in nor contiguous to a hospital.

2.3 COSTS AND UTILIZATION OF SERVICES UNDER PREPAID AND FEE-FOR-SERVICE PRACTICE

Comparisons of costs between HMOs and the traditional insurance/fee-for-service system (Luft, 1978; Wersinger and Sorenson, 1980) indicate that the total cost of medical care (premium plus out-of-pocket expense) for HMO enrollees is lower than for comparable people with traditional insurance coverage. This differential ranges from 0 to 40 percent depending upon the type of HMO being studied. This total cost differential does not appear to be due to greater efficiency in production of services; but is apparently due to differences in utilization of medical care, particularly hospital services (Luft, 1980).

The cost savings generated within the HMO delivery system structure are reflected in premiums. HMOs typically offer more comprehensive coverage for about the same premium as traditional insurance plans. Luft (1981) states "although HMO premiums used to be somewhat higher, in many instances they are now even lower than conventional plans" (p. 5.2). Evidence on this issue is very consistent across all studies of HMO and traditional insurance premiums.

As was discussed earlier in this chapter, there are several types of HMOs. The most general distinction is between:

- Prepaid Group Practice (PGP) HMOs which pay physicians on a salary or capitation basis; and
- Individual Practice Association (IPA) HMOs which reimburse physicians on a fee-for-service basis.

Total costs of enrollees in PGPs tend to be substantially lower than those incurred by enrollees in IPAs. Lower rates of hospital usage of approximately 35 percent are reported for PGP enrollees compared with 5 to 25 percent lower rates for IPA enrollees. Enrollees in IPAs have substantially higher utilization of ambulatory care visits than do PGP enrollees. These factors suggest that per patient costs for IPAs will be higher than in PGPs, for identical benefits. However, some enrollees with preferences for a particular physician may choose an IPA for that reason, even when benefits are lower or costs are higher. Other factors, such as geographic location, may also influence choice of plan. The IPA form of HMO may be used by fee-for-service physicians to compete with HMOs; in some cases, IPAs have been established as an anti-competitive response to prevent PGPs from gaining a share of the local market (Kissam, 1978; Havighurst, 1970). There are substantial differences between these forms of HMOs, and these differences create cost differentials.

Langwell and Moore (1982) summarize the evidence on costs and utilization of health services provided by HMOs and fee-for-service practices:

Cost and utilization: HMOs appear to be a less costly mechanism for providing health services. Total expenditures for medical services, in-plan and out-of-pocket, usually are lower for HMO enrollees than for persons covered by traditional insurance plans. Lower hospital utilization appears to be the primary means through which savings are achieved. IPAs, which have services provided by participating fee-for-service physicians, do not achieve the substantially lower costs which result in PGPs where physicians are paid on a salary or capitation basis. The extent to which lower costs for HMO enrollees reflect financial and organizational incentives to change behavior or reflect self-selection by physicians or enrollees is undetermined (p. 74).

2.4 LIMITATIONS TO THE EXISTING RESEARCH ON COSTS AND UTILIZATION OF PREPAID AND FEE-FOR-SERVICE HEALTH SERVICES

Federal policy toward HMOs has been based upon the evidence, reviewed above, that total costs per enrollee are lower in some forms of HMO and that the apparent cost differences are due to reduced hospital admissions of enrollees in HMOs. However, despite the fairly strong evidence supporting these conclusions there remains doubt about whether these reduced costs and utilization are truly an outcome associated with the HMO practice form, or whether it is an outcome resulting from self-selection of enrollees in HMOs, or some other unexplored factor. Luft (1981) has pointed out the importance of, and evidence for, HMO self-selection based upon the consumer's tastes for or propensity to be hospitalized, not on illness level. Langwell and Moore (1982) review the literature on self-selection bias and HMO costs and utilization. They conclude that the several studies* of the characteristics of individuals who choose to enroll in HMOs and those who choose traditional insurance have yielded inconclusive evidence on the issue of self-selection.

It is apparent that existing research on costs and utilization of services under prepayment and fee-for-service practice has yet to answer the question:

- Does the prepayment mechanism and/or the HMO organizational form yield reduced costs and utilization or is this observed relationship the result of self-selection of HMO enrollees or some other unexplored factor?

* Tessler and Mechanic (1975); Bice (1975); Gaus et al. (1975); Berki et al. (1977); Scitovsky et al. (1978); Lewis (1969); and Luft (1981).

If the observed cost and utilization effects of HMOs are the consequence of HMO enrollees' different tastes or health status, then the current Federal policy of fostering the growth of HMOs can be expected to have little or no impact on aggregate expenditures for health care. Research on costs and utilization of health services in HMOs and fee-for-service practices should focus on case-mix adjusted data or on analyses of costs and utilization of services in each practice form for patients with selected, well-defined diagnoses.

Other critical questions remain. Pauly and Langwell (1982) note that it remains uncertain whether HMOs do reduce total costs and continue:

If a definitive study is conducted and the results show that HMOs reduce total cost, the next crucial question--also still unanswered--is how this occurs. Luft's (1981) review of the literature indicates that the impact of HMOs on utilization is virtually all on hospital admission rates, but what conditions within the HMO induce this change are uncertain. Is it the financial incentives to physicians? Is it the closed panel or self-selected nature of the physicians in the group? Is it the group practice itself? What is needed to resolve this issue are two things: (1) an adequate theoretical specification of incentives in HMOs; and (2) a large sample data set that allows inclusion of experience from a wide variety of HMOs, along with that of conventional providers (p. 44).

A major research issue related to this topic is that the vast majority of studies of costs and utilization of services by HMO enrollees are based upon comparisons of the cost and utilization experience of consumers who receive services from fee-for-service providers. However, fee-for-service providers are not a homogeneous group. Several studies compare solo, fee-for-service practitioners with physicians organized into group practices and have found substantial differences in physicians choosing these organizational forms: physicians choosing group practice over solo practice tend to be younger than average, graduates of U.S. medical schools, and board certified in their specialty, with age being the most important predictor of group practice choice (Goodman and Wolinsky, 1982). The fact that younger physicians are most likely to be in a group practice is consistent with AMA data indicating a substantial growth in the proportion of physicians practicing in groups in the U.S.

The American Medical Association has conducted periodic surveys of medical group practices (1965, 1969, 1974, and 1980). Results of the 1980 survey indicate:

- Of 10,762 group practices identified, 57.2 percent were single specialty groups; 33 percent were multispecialty groups; and 9.8 percent were family practice groups.
- The majority of group physicians (61.3 percent) practiced in multispecialty groups.
- The average size of group practices was 8.2 physicians; however, more than two-thirds of all group practices had 5 or fewer physicians.
- Three of the 10 Census Divisions (East North Central, Pacific, and South Atlantic) accounted for 50 percent of all groups and 52.4 percent of all group physicians.
- 17.4 percent of all group practices reported that they provided some care on a prepaid basis; only 3 percent of group practices identified reported that 75 percent or more of their dollar volume was from prepayment.
- Between 1969 and 1980, the number of group practices in the U.S. increased by 70 percent; by 1980, nearly one out of every four active, non-Federal physicians was practicing in a group on a part or full-time basis.

The trend toward increasing group practice is well-documented and may have implications, still relatively unexplored, for the costs and utilization of medical services in the future. Luft (1981) reviews the evidence on efficiency and economies of scale in group practice and concludes that the findings are mixed: "Some studies suggest that cost per unit of output, such as an office visit, falls with increasing group size (Yett, 1967; Reinhardt and Yett, 1972), while others indicate either no economies of scale or increasing costs as group size increases (Bailey, 1970; Yankauer et al., 1970; Kimbell and Lorant, 1972, 1973). The most comprehensive study available (Held and Reinhardt, 1979) supports the view that the cost per unit of output may fall with practice size, but the minimum cost is achieved at rather small size groups (3-5 physicians) and, thereafter, the cost per unit of output may be constant or even increase" (pp. 40-41).

Few studies have focused on comparisons of costs of services under fee-for-service and prepaid group practice. Held and Reinhardt (1980) find that physicians in prepaid group practice are less productive than physicians in fee-for-service group practice when output is measured as

office visits per week or hour, hospital visits per week, and operations performed per week. A more comprehensive examination of this issue (Held and Reinhardt, 1979) finds that no productivity differences are found after differences in non-physician inputs and financial incentives to enhance physician productivity are controlled. However, Watkins et al. (1976) and Hughes et al. (1974) report that surgeons in prepaid group practices have substantially higher workloads than do surgeons in fee-for-service practice.

Scitovsky (1981) examines the use of medical services by patients enrolled in a prepaid group practice and those obtaining care from a predominantly fee-for-service multispecialty group. The findings of this study indicate that, for the most part, the pattern of medical care utilization under the two forms of practice is similar: (1) the rate of ambulatory care per patient averaged 2.97 for prepaid enrollees and 3.05 for fee-for-service patients; (2) there were detected no significant differences between the two forms of practice in the rates of patient-initiated visits and physician-initiated visits; and (3) hospital use under the two forms of practice was virtually identical. This study was the only one identified in the literature which directly compares utilization of services by patients of prepaid and fee-for-service group practices. There are, however, substantial limitations to this study which suggest that the findings may not be generalizable. The patients in this study are Stanford University employees and their families who may represent a rather more sophisticated consumer group than the average population. In addition, the location of the study is Palo Alto, California which is an area with an extremely competitive health care marketplace characterized by numerous HMOs and IPAs and with substantial competitive responses of the fee-for-service system to the increasing market share of HMOs in the area. As a result, it is possible that local competitive pressures on the fee-for-service system may cause fee-for-service physicians to modify their behavior. Finally, it should be recognized that the particular fee-for-service multispecialty group practice provided services on a capitation basis to the Stanford University enrollees studies. The fact that the practice agreed to accept capitation suggests that the members had assessed their

prescribing behavior and were relatively certain that the costs of providing care for these patients would not, under normal circumstances, exceed the capitation.

A 1982 study conducted by the California Health Facilities Commission examines costs and utilization of hospitals owned by Kaiser, California's largest HMO, and non-Kaiser hospitals in California to determine whether, and why Kaiser hospitals experience lower hospitalization rates and costs than non-Kaiser hospitals. They find that cost per person per year was much higher in non-Kaiser hospitals, due primarily to higher hospital admissions per 1,000 in the non-Kaiser population. These lower admissions are somewhat accounted for by the fact that Kaiser has fewer Medicare and Medi-Cal enrollees; however, a 61 percent admissions differential remains. While the utilization data are relatively straight forward, the inability of the study to adjust for factors other than Medicare and Medi-Cal status indicates that a large portion of the remaining differential may be due to unexamined differences in demographic and health characteristics of these two populations. No attempt is made to examine the source of cost differences beyond the "admissions" variable, leaving the question of relative efficiency untouched. Given the limited data available, however, this omission is justified.

The limitations to the few existing studies of costs and utilization of health services provided by prepaid and fee-for-service group practices are relatively substantial. While these studies provide some initial indications of differences and similarities between the two forms of practice, no definitive and generalizable results are yet available.

2.5 CONCLUSIONS

Federal policy encouraging and supporting the development of HMOs has been based upon research findings which suggest that HMOs provide services at a cost substantially less than traditional fee-for-service practitioners. However, many researchers suggest that the effect of HMOs on costs and utilization of health services has not yet been conclusively demonstrated; self-selection of enrollees and/or of HMO physicians with

different characteristics (e.g., health status, age, race) or "tastes" for medical care styles may account for the observed lower costs and utilization of medical services. If so, then expanding HMO market shares will not reduce overall costs and utilization of services, but merely segment the market into those with less expensive care and those individuals preferring more expensive medical care styles.

Alternatively, once it has been conclusively demonstrated that cost savings are associated with the HMO method of health care delivery, a critical question remains to be answered: How are these savings achieved? A number of possibilities have been suggested in the literature:

- the prepayment mechanism itself may create a condition to which physicians respond in diagnostic and treatment decisions;
- the nature of the financial incentives offered to physicians may determine physician behavior;
- the organizational form may create conditions which cause physicians to modify diagnostic and treatment decisions, regardless of whether care is provided on a fee-for-service or prepaid basis.

To date, little firm evidence on these issues has been produced through well-designed and generalizable research studies.

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CHAPTER 3

SITE SELECTION AND PARTICIPATION

The selection of sites for participation in this study was accomplished through a process of:

- preparing a typology of the practice forms to be studied;
- developing criteria for selection of city sites and practices;
- identifying geographical areas which met the city-site criteria;
- identifying practices within the selected cities; and
- contact of potential practices by Medical Group Management Association to obtain participation agreements.

While Chapter 2 presented an overview of the typologies of practices of interest, this chapter will: discuss the specific characteristics of practices that were selected; present the site selection criteria employed; and describe the process of site selection. In addition, this chapter will describe the experiences of the project staff in securing participation of the practices and the limitations imposed by site selection on the overall study.

3.1 TYPOLOGIES OF PHYSICIANS' PRACTICE ARRANGEMENTS

The review of previous research in Chapter 2 of this Report and extensive discussions among the participants in this project formed the background for the determination of the typologies of physicians' practice arrangements to be included in this study. In this section, the conclusions reached through this process are briefly described.



Prepaid Group Practices (PGP-HMO)

After reviewing the findings from a number of analytical studies which have been conducted and discussions with project consultants, it was concluded that the "pure" organizational form of an HMO of the prepaid group practice type is a staff model which:

directly employs physicians who are paid on a salaried basis for providing medical services to the enrollees in the practice.

The Group Health Cooperative of Puget Sound is an example of the "pure" organizational form of a prepaid group practice HMO.

For the purposes of this study, the group model PGP is also of interest. One of the primary issues of interest is the relationship between mechanisms for reimbursing physicians and utilization of health services. Staff model PGP physicians have no economic incentives to either enhance or constrain utilization of services. Group model PGP physicians, on the other hand, are normally "at risk" financially for excessive utilization and, therefore, may be more likely to constrain utilization. Consequently, both group model and staff model PGPs are of analytic interest and were included among the sites selected.

Individual Practice Associations (IPA-HMO)

A common set of descriptive characteristics distinguish IPA and PGP type HMOs from fee-for-service group practice. Beyond these basic distinctions, it has been concluded that the "pure" organizational form of an IPA is one in which:

the IPA makes arrangements with independent physicians and physician groups for services to be provided to IPA enrollees; these independent physicians may receive either fee-for-service reimbursements or capitation payments for IPA enrollees, but are not employees of the IPA.

The independent physician who is providing services to IPA enrollees may see only a small number of IPA enrollees as patients. However, for some physicians, IPA enrollees may constitute a large portion of their total practices. The method of payment by the IPA to the independent physician

may also vary. These factors, and others, which may effect utilization decisions of physicians and patients, represent within-group variations on the basic IPA organizational model defined above.

Fee-For Service Group Practices

Fee-for-service group practices may be distinguished from IPA and PGP type HMOs by the following characteristics:

- the patient load of a fee-for-service group practice varies continually;
- no contractual relationship exists between the physician and the patient; and
- the patient requests and pays for specific services received from the physician (i.e., the costs of services are directly related to the utilization of services).

The "pure" organizational form of a fee-for-service group practice is described by the American Medical Association's definition:

three or more physicians formally organized to provide medical care, consultation, diagnosis, and/or treatment through the joint use of equipment and personnel, and with the income from medical practice distributed in accordance with methods previously determined by members of the group.

3.2 SITE SELECTION CRITERIA

An "ideal" study of utilization of health services under alternative physicians' practice arrangements would identify five PGP-HMOs, IPA-HMOs, and fee-for-service multispecialty group practices which fit neatly into the typology for practice organization and physician payment modes described above, and which are selected for standardized secondary characteristics. Direct comparison of these practice forms and associated utilization patterns would permit conclusions to be drawn on the effect of alternative practice arrangements on the utilization of health services. However, selection of practices which differ only in the organizational and physician payment modes is an impossibility. At a minimum, regional differences in health care utilization patterns would create differences in the observed utilization of services within

practices of the same organizational form. Therefore, it was essential in this study to develop and use analytical approaches which addressed the question of whether differences in the utilization of health services are significantly associated with alternative practice arrangements, while accounting for variations in other characteristics of practices. It may also be of substantial interest to examine within-group differences in utilization patterns to determine whether specific characteristics, within an organizational form, are associated with differences in utilization of services among practices of the same organizational form. The extent to which within-group analyses can be conducted is limited by the small number of observations available. However, the results of this effort should yield insights into within-group variations which may provide direction to future, more extensive, studies.

The selection of sites for participation in this project was a two-part process. First, the essential characteristics of the practices to be included were developed. Substantial discussion of these characteristics has been presented in Chapter 2 in the section on typologies of practices. Then, cities which had one or more practice of each type to be studied were identified, and additional city selection criteria were developed. Each of these aspects of site selection are discussed in the sections of this chapter which follow. In this section, several general considerations and recommendations are presented.

Since the time frame of this study was relatively short, considering the extent of the data to be collected and the analyses to be undertaken, Applied Management Sciences recommended that no more than five of each type of alternative practice arrangement (i.e., PGP-HMO, IPA-HMO, and FFS) be selected for participation in this study. This suggestion permitted the staff to collect data from practices in different regions of the country while limiting the amount of time spent in travel and use of other project resources.

In order to ensure that regional variations in utilization patterns did not confound the analyses, it was recommended that, in each city, one of each practice form be selected. Further, the site selection process

considered the intraurban location of the practice. Since differences in utilization patterns may be associated with inner city, suburban, or exurban locations, an effort was made to avoid selecting practices with differing intraurban location patterns.

Selection Criteria for Practice Sites

The primary characteristics of the organizational forms of PGP-HMOs, IPA-HMOs, and fee-for-service practices which have been described were the basis for the practice site selection recommendations. The recommendations were that:

- PGP-HMOs should include both staff model HMOs in which the physicians employed are paid on a salaried basis for providing medical services to the enrollees in the practice, and group model HMOs in which the physicians are "at risk" financially for excessive utilization.
- The selected IPA-HMOs should include both sites which reimburse participating physicians on a fee-for-service basis and sites which reimburse participating physicians on a capitation basis for services provided to IPA members.
- The fee-for-service group practice should include multiple specialties and should be characterized by the presence of a formal agreement among the physician members to jointly use all equipment, facilities, and personnel and to distribute income generated by the practice to physician members, using methods previously determined by group members.
- The sizes of the practices to be selected should be approximately the same among and within the practice forms. Since the number of practices studied was relatively small, thus, substantial size variation could introduce confounding effects into the analyses. At a minimum, multi-specialty fee-for-service group practices were sought with 15 or more full-time physicians in order to be comparable with the prepaid practices. Research has suggested that group practices of three to five physicians exhibit maximum economies of scale--however, the HMOs in the study had substantially larger staff. Therefore, multi-specialty fee-for-service group practices should be of larger than optimal size for purposes of comparison.
- All practice sites selected should have been operating a sufficient number of years that the practice is "mature", with full patient loads, established procedures, completed facilities, and established financial viability.
- PGPs and multi-specialty fee-for-service group practices should be relatively "pure" in source of income, i.e., HMOs should be 90 percent or more prepayment-based and multi-specialty

fee-for-service group practices should be 90 percent or more fee-for-service-based. IPA physicians were expected to have varying mixes of prepayment and fee-for-service patients.

- Practice sites should have established medical record procedures that are either uniform or can be made comparable to procedures used by other sites.
- Practice sites selected should agree to assist the project staff in acquiring permission to gain access to related medical records from referral physicians, hospitals, and other providers of services, as necessary.
- The patient populations should be considered prior to site selection, to the extent possible, to avoid selection of practices which provide services to a population with nonrepresentative characteristics (e.g., an HMO may have no patients over age 65, if membership is drawn exclusively from employment-based contracts).

At the first Consultant Panel Meeting on November 9, 1982, these criteria were reviewed and discussed. Additional criteria suggested by the Panel included:

- Specialty composition, especially of fee-for-service groups, should be a criterion.
- The group model PGP should receive services from a medical group that provides only services to the PGP.
- To the extent possible, federally qualified HMOs should be selected in order to take advantage of the financial data available on these practices.
- IPA management should agree to provide access to medical records in participating physicians' practices.
- Regional utilization patterns, regulatory environment, and cost indexes should be considered.
- Some variation is desirable in ownership of facilities (e.g., ancillary services, hospitals) by the selected practices.

These criteria were set out as the "ideal" selection bases. As will become clear, it was not feasible to apply all the ideal constraints to the selection of sites. These criteria represent the results of deliberations by Applied Management Sciences' staff, consultants, and the Project Officer and others on the conditions which would produce data which are susceptible to analysis and comparability among the three practice forms to be studied.

Selection Criteria for City Sites

Consideration of the study design and of the observed regional diversity in utilization of health services suggested that attention be directed to selecting cities within which practices are located, as well as selection of specific group practices. The following recommendations were developed for selection of five cities to be studied:

- The cities in which sites are selected should be geographically diverse. Applied Management Sciences recommended that one city be chosen from each of the following regions and that one of each type of group practice be selected in each city:
 - North East
 - South
 - Midwest
 - Mountain
 - West.
- The cities in which sites are chosen should have a reasonable selection of sites available for all forms of group practice to be studied. Therefore, it was recommended that cities:
 - be mid-to-large population areas
 - have multiple HMOs and IPAs that have been in existence for several years.
- The cities from which group practices are to be selected should not have been studied extensively in the past by researchers addressing issues of health care delivery system characteristics.
- The cities from which group practice sites will be selected should not be outliers with respect to HMO market penetration.

As was the case in the previous discussion, these ideal selection criteria could not be applied with precision. However, the criteria were used to select five city-sites.

3.3 EXPERIENCES AND LIMITATIONS

A variety of difficulties were encountered when attempting to apply the consolidated list of practice and city-site criteria simultaneously. Perhaps the most constraining criterion was that cities should not have been studied extensively in the past. As soon as the major HMO centers were eliminated (e.g., New York, San Francisco, Los Angeles, Minneapolis-

St. Paul), the number of cities with two or more practices of each type was reduced substantially. In fact, fewer than 15 cities met the criterion.

A listing of the potential city-sites was presented to the Project Office for final selection. Four of the five cities selected by the Project Office had to be eliminated when appropriate practices could not be recruited. Replacements were found from the original list of cities meeting the criterion; however, during this process the entire list had to be used.

It is considered instructive to review the general classes of problems encountered in the selection process. First, a few of the more well-known, national HMOs chose not to participate in the study. While the reasoning was never made clear, there appeared to be a centralized decision rather than a practice-specific decision. Secondly, a substantial number of practices admitted that their data systems would not support the study requirements. More specifically, a number of plans had no mechanism in place for identifying patients by diagnosis, and still others had only recently put such systems in place. In the latter cases, there was no historical base of information for identifying appropriate patients.

A third class of practices indicated that a variety of destabilizing factors were occurring at the proposed visit times. These factors included dramatic periods of growth (and, hence, the staff could not be made available), organizational changes were anticipated (and, hence, the staff was preoccupied), new systems were being installed, and/or problems were found in the existing systems.

Finally, a fourth class of problems may be characterized as a perception of burdening the staff. While the site visit design attempted to consider staff burden, in a few cases the practices simply did not wish to bother, or alternatively did not want to chance any disruption of staff assignments. (It is of interest to note that the project staff was willing to perform the data collection activities in the evening or on weekends, and was willing to reimburse practice personnel for working after normal business hours.)

Further, the involvement of MGMA, a recognized national organization, significantly improved the receptivity of the study to the practices. And, despite the problems cited above, the requisite number and types of practices were initially secured.

However, because of the problems and the limited numbers of cities to begin with, certain compromises were required. Among these were the following:

1. A few of the practices were at the low end of the acceptable number of full-time physicians (i.e., Central FFS and Atlantic PGP);
2. Many of the practices were found to have deficient medical records procedures (as will be discussed in the chapter that follows);
3. A few group model PGPs received services from medical groups providing services to other organizations/individuals (i.e., Pacific PGP, Central PGP, and Atlantic PGP); and
4. The IPAs did not wish the project staff to visit individual practices.
5. In two of the city sites, substitute practices had to be secured from outside the original target area (i.e., West PGP and Central FFS).

None of the compromises was seen as being significant and, in fact, at the completion of site selection the overall objectives appeared well in hand.

However, a set of more compelling problems was uncovered once the staff members visited the practices. The context of this discussion is as follows. Because of the resource limitations of the project (i.e., both elapsed time and funding), the staff selected the study practices based on a review of secondary data and telephonic screening. It was not until the participation was secured that the staff visited the practices. Once on site, the staff found that some of the practice characteristics sought were not available. Most notable among these missing attributes was orderly medical records procedures. Again, a comprehensive discussion of data collection experiences is presented in the next chapter. As a result, it is strongly suggested that future study designs include a pre-selection visit to potential sites in order to ensure that the attributes sought are present in the practice.

Another set of problems resulted from interviewing only the HMO administrators; in some PGPs and IPAs, the HMO administrators possessed only limited information on the medical groups providing services (i.e., Pacific IPA, West IPA, Midwest IPA, Central IPA, and Atlantic PGP). Therefore, it is also recommended that future studies plan to interview both the HMO and the medical group administrators and medical directors. (Another interesting finding of the project is that the CEOs of many practices simply did not know the state of medical records in their organization.) Copies of the interview guides used to collect information from each of the three types of practices (i.e., PGP, IPA, and FFS) are presented in Appendix E.

Chapter 4

DIAGNOSES SELECTION AND MEDICAL RECORD ABSTRACTING

The selection of diagnoses for which data on utilization of services were collected was considered critical to the success of this project. On November 3, 1982, Applied Management Sciences' staff met with Rita Finnegan, Executive Director of the American Medical Record Association (AMRA), Dr. John Drabek of ODAM/HRSA, and the ASPE Project Officer and her staff. The purposes of this meeting were to: (1) discuss and develop diagnosis selection criteria; (2) discuss and develop recommendations for the six diagnoses to be included in the study; (3) develop medical record abstracting procedures that will be used during the data collection phase of the study; (4) discuss the structure of medical record organization in ambulatory care settings; and (5) develop site selection criteria relative to the organization of medical records. A report on the outcome of this meeting was prepared by Applied Management Sciences' project staff and circulated to the project consultants and to selected ASPE staff. This report was a discussion item at the first Consultant Panel Meeting on November 9, 1982.

The discussion in this chapter incorporates all the comments and changes requested by the Project Officer in response to the guidance received from the various project participants. The following sections present: (1) a discussion of the diagnosis selection criteria and the selected diagnoses; and (2) a discussion of the methodology for collecting the diagnosis-specific data. In addition, the data collection experiences and the limitations imposed on the project are also presented in this chapter.

4.1 DIAGNOSIS SELECTION CRITERIA AND DIAGNOSES SELECTED

During the first few weeks of this project, Applied Management Sciences' staff reviewed the literature on diagnosis-specific studies and on the distribution of diagnoses among ambulatory and inpatient utilization. A study by Scitovsky (1967) provided an example of the use of diagnosis-specific data to examine costs of medical care and changes in costs over time (1951-65) in a group practice setting. Criteria for diagnosis selection in that study included:

- the illness had to be common or representative of a group of common illnesses (e.g., pneumonia was selected as an example of respiratory illnesses);
- the diagnoses selected should include illnesses ordinarily treated entirely on an outpatient basis (e.g., otitis media, acute cystitis);
- a diagnosis should be selected that is always treated by hospitalization (e.g., appendicitis);
- one or more diagnoses should have alternative outpatient or inpatient treatment modes (e.g., pneumonia, duodenal ulcer);
- one or more diagnoses should include both outpatient and inpatient treatment modes (e.g., normal pregnancy and delivery);
- the set of diagnoses selected should cover all age groups in the patient population; and
- the set of diagnoses should result in the selected sample of cases containing approximately the same number of male and female cases.

The original study plan developed by Scitovsky included ten diagnoses:

1. otitis media in children
2. fracture of the forearm
3. acute cystitis
4. hypertension
5. pneumonia
6. duodenal ulcer
7. coronary occlusion
8. maternity care
9. acute appendicitis
10. cancer of the breast.

Diagnosis Selection Criteria

Based on the review of the literature and comments of the project participants, Applied Management Sciences' staff developed a set of diagnosis selection criteria. These included:

- the diagnosis should be frequently observed by physicians in ambulatory settings;
- the diagnosis should be a well-defined occurrence;
- the diagnostic procedures and treatment(s) associated with the selected diagnosis should offer a range of medically acceptable alternatives; and
- a range of chronic conditions, short-term acute, ambulatory treatment conditions, and acute, inpatient hospital treatment diagnoses should be selected.

The first criteria requires the diagnosis should be relatively frequently observed by physicians in an ambulatory setting. The importance of this criterion is clear--there should be sufficient cases for each diagnosis to permit comparative analysis across the three practice settings. The Project Officer indicated that compliance with this criterion, while still maintaining a random sample, does not necessarily require selection of the most frequently found diagnoses. If, for example, a particular diagnosis yields only thirty patients in a practice setting--the size of the sample to be analyzed for each practice setting--all thirty patients could be analyzed without inflicting bias on the study. Hence, the essential consideration with respect to this criterion is that there should be sufficient cases to permit comparative analysis.

The next diagnosis selection criterion requires that the diagnosis be a well-defined occurrence. That is, the diagnosis should reflect a specific disease. It would not be sufficient to collect data on the category of, for example, "heart disease" because this could include a wide range of conditions of varying severity and accepted practice. Evaluation of utilization of health services for this type of disease category under alternative physicians' practice arrangements would not yield useful comparative data. Moreover, this type of broad statement of disease condition probably would not be a discrete category of the practice setting's billing or recording system. Data extraction would, therefore, be unnecessarily burdened.

The third criterion suggests that, while it is desirable to avoid including diagnoses for which extremely controversial treatments are available, it is essential that a medically acceptable range of diagnostic and therapeutic procedures be associated with the diagnosis in order to detect systematic variations in practice styles among the organizational forms to be studied.

The final diagnosis selection criterion requires that a range of conditions be selected for analysis. These include:

- chronic conditions;
- short-term acute, ambulatory treatment diagnoses;
- acute, inpatient hospital treatment diagnoses;
- diagnoses that might lead to hospitalization depending upon the form of treatment provided;
- diagnoses that might include referral to a specialist (however, conditions likely to lead to complete self-referral, outside the practice, should be avoided);
- sex-specific conditions; and
- the set of diagnoses selected should result in inclusion of all age groups in the patient population (i.e., at least one pediatric condition should be included in the study).

The underlying assumption in choosing diagnoses that comply with the foregoing list, is that there may be differences in how alternative physicians' practice arrangements treat or charge for one or more of these categories. Hence, the set of diagnoses selected should be representative of the entire list since exclusion of one category might cause differing practice characteristics to go unnoticed.

Diagnoses Selected

The process of selecting specific diagnoses for use in this study involved all the project participants, with final selection by the Project Officer in consultation with Dr. Rubin, Assistant Secretary for Planning and Evaluation. These diagnoses (with associated ICD-9 codes) are:

- pediatric asthma 493 with any fourth or fifth digits specified in patients 14 years of age and under;
- duodenal ulcer 532 with any fourth or fifth digits specified;
- non-specific uterine bleeding, dysfunctional and functional not otherwise specified 626.8
- acute otitis media 382.0 with any fifth digit;
382.4;
382.9 - acute only
- acute and chronic cholecystitis 574.0 with 0 or 1 as fifth digit
574.1 with 0 or 1 as fifth digit
574.3 with 0 or 1 as fifth digit
574.4 with 0 or 1 as fifth digit
575.0
575.1
- maternity care^{1/} not an ICD-9-CM category, but possible to identify patients assigned the following codes:
V22.0 - Supervision of normal first pregnancy
V22.1 - Supervision of other normal pregnancy
V23 - Supervision of high-risk pregnancy

To determine whether a sufficient number of cases for each diagnosis would be available in each group practice studied, two activities were undertaken:

1. Dr. John Drabek of HRSA analyzed the National Ambulatory Medical Care Survey data to determine the frequency of visits to providers for services associated with the specified diagnoses; and
2. the Medical Group Management Association requested that a participating group practice identify all cases of the selected diagnoses seen in the practice during 1982.

These checks confirmed that none of the diagnoses selected should be a problem with respect to frequency of occurrence.

4.2 MEDICAL RECORD ABSTRACTING METHODOLOGY

Applied Management Sciences arranged with the American Medical Records Association (AMRA) to identify and provide training to accredited medical record administrators or technicians for abstracting relevant data from the medical records of individuals with the selected study diagnoses. AMRA selected a local area coordinator for each city-site who was responsible for training the medical records personnel. A small number of abstractors were utilized to provide uniformity of data collection. AMRA's participation in this study ensured that:

- the abstractors selected were fully trained in medical record procedures and diagnostic codes in both ambulatory and inpatient settings;
- the abstractors would be able to extract the necessary data in the minimum time and be minimally disruptive of the medical record departments of the participating practices; and
- the abstractors would be fully informed and aware of the requirements of the Privacy Act and the need for confidentiality of data.

The procedures followed in the collection of utilization data included:

- for each practice, an estimate of the total patient population was obtained;
- for each diagnosis, an estimate of the frequency of occurrence was identified;
- the expected number of cases with each diagnosis in the specific practice was then calculated, based on frequency of occurrence and patient population size;
- random number processes were then applied^{2/} to "pull" 30 cases with each diagnosis from the records in each practice;^{3/}
- the full record for calendar year 1982 of each selected case was abstracted for all utilization data related to the diagnosis of interest (a full year's worth of data was obtained for maternity cases).

Applied Management Sciences furnished AMRA with a listing of data elements to be collected from the medical records by AMRA's staff. AMRA then designed the source document that was used by the medical record personnel for abstracting data. The source document has a separate demographic section that was completed, at the outset, for each patient

record abstracted. This eliminated recording repetitive demographic data from subsequent patient visits. A copy of the medical record abstracting form prepared by AMRA is presented at the end of this chapter.

4.3 DATA COLLECTION EXPERIENCES AND LIMITATIONS

In order to permit a direct comparison of utilization of services across the sites, data were collected from the medical records of individuals with specific diagnoses. Moreover, to the extent possible, a complete set of consistent data elements, relating to each diagnosis, was collected at each practice. During data collection three sets of problems were encountered: (1) problems associated with identifying suitable cases for inclusion in the study; (2) problems associated with the actual abstracting of utilization information; and (3) problems associated with obtaining the requisite study sample at each practice. An additional, and overriding problem resulted from the time period selected for data collection. These problems, associated methodological issues, and palliative measures implemented are discussed in this section.

Problems Associated with Identifying Cases

A major factor affecting the ability to identify a pool of suitable cases for the study was whether the practice site had a computerized information system, and whether the information system could be used to access medical records by diagnosis. The ideal situation for the data collection needs of this study existed when the site had an information system which could provide a listing of patients according to ICD-9 codes, so that a random sample could be drawn from the universe of suitable cases. The great majority of practice sites had a system with these capabilities; specifically, the following practices had fully satisfactory information systems:

- West IPA
- West FFS
- Central FFS
- Central PGP

- Central IPA
- Pacific IPA
- Pacific FFS
- Atlantic PGP
- Atlantic IPA
- Midwest PGP
- Midwest FFS

Three of the 14 practices did not have a computerized information system: Pacific PGP; one of the two sites which were used to collect information on Midwest IPA enrollees; and West PGP. At the Pacific PGP, it was necessary to review claims data for "episodes of care" related to the diagnosis of interest; and, using these data, identify patients who were treated for these diagnoses. Although this system ultimately proved adequate for identifying cases, it was extremely time consuming because many times the "episode of care" proved not to be a useful determinant of a particular diagnosis.

At one of the medical groups associated with the Midwest IPA, it was necessary to actually "hand-pick" through all of the 1982 medical records in order to identify cases with the diagnoses of interest. Once the universe of suitable cases was identified, a random sample of 30 cases for each diagnosis was chosen. Here, as with the Pacific PGP, the process of identifying and choosing cases for inclusion in the study was extremely time consuming.

At West PGP, the medical record department identified cases through their manual indexing system. The medical record abstractors examined the selected cases closely to ensure that cases were randomly chosen by the practice and that specific physicians and/or departments were not selected purposely.

Another important factor related to identifying cases with the study diagnoses is the classification system used by the practice sites. In practices where ICD-9 codes were used, identifying cases with the exact study diagnoses was not a problem--as long as the cases were coded correctly. However, in the sites which did not use the ICD-9

classification scheme, it was necessary to ensure that comparable disease entities were identified. Of the eleven sites which had computerized information systems, two did not use the ICD-9 classification scheme:

- Midwest PGP
- Central FFS

This did not prove to be a problem, however. At the Midwest PGP, the project staff and the medical director matched diagnostic codes from their system with the study diagnoses. Central FFS uses a coding system which is similar to the ICD-9 classification, but the categories are slightly broader. Therefore, the abstractors checked closely for diagnostic comparability prior to abstracting each case. In addition, Pacific PGP (a practice without a computerized system) uses ICD-8 codes; in this case, the abstractors monitored for variations in the coding of diagnoses.

An issue related to the coding of diagnostic categories, was the classification of various procedures. At the West IPA it was necessary for the abstractors to convert data from the assigned CPT-4 codes into specific procedures and tests. Although this is a relatively simple conversion, it was also time consuming.

Another problem which was found in varying degrees in almost all of the practice sites was coding or indexing inaccuracies. Cases were identified as being associated with a particular diagnosis when in fact that diagnosis was not present. For example, patients presenting with gastrointestinal discomfort were coded as having a duodenal ulcer even though the diagnostic work-up revealed cardiac problems as the reason for the symptomology. This type of problem necessitated a preliminary review of all cases for possible errors, in order to mitigate data inconsistencies.

Problems Associated with Abstracting Utilization Data

Utilization information was abstracted from two sources: medical records and claims data. Impediments to data collection associated with abstracting information from these sources are discussed below.

Medical Record Abstracting Problems

Two problems were encountered during the medical record abstracting process: disorganized medical records departments and disorganized medical records. The first problem led to difficulties in finding the chart or medical record once the case was identified as suitable for the study. The second problem caused difficulties in finding relevant utilization information. For example, laboratory and radiology reports were missing and physician progress reports were incomplete in a number of practices. In the majority of practice sites, these problems did not arise. Most of the sites utilize a system in which medical charts are charged out to a particular department and a log is kept indicating its location and the service being provided to the patient. Moreover, the majority of practice sites assign each patient an identification number, regardless of the service being provided, which is used to ensure that all patient documentation (e.g., laboratory reports) become part of a centralized patient record. Indeed, at one site, Pacific FFS, record keeping standards were of extremely high quality. All entries were typed. In addition, a Medical Records Committee audits the medical records to ascertain the completeness, clarity, and appropriateness of the medical records keeping.

Departures from these protocols were evident at some of the study sites. The greatest difficulty in locating patient charts was experienced at the West FFS. At that practice, the medical record abstractors encountered a medical records department which frequently had records misfiled or missing without a clear indication of where the records might be. It is noteworthy that at this particular site, the abstractors were required to "pull" and "refile" their own charts, indicating a loosely controlled system. In addition, the medical records at this site were found to be disorganized. Laboratory and radiology reports were located in various parts of the medical record and occasionally they were missing entirely. A similar, but even more severe situation existed at the Atlantic FFS. At that practice, the problem was compounded by multiple service sites. After spending an inordinate amount of time, it was determined that locating complete records was

possible in so few cases that it was not useful to complete abstracting at the practice. As a result, Atlantic FFS was dropped from the study.

Other sites presented these types of problems, although perhaps not quite as severely. It appeared that in some practices the quality of the medical records varied by departments or, in some instances, by individual physician. In all cases, every attempt was made to find missing data. In instances where this was not possible or where it was evident that significant gaps in the data would occur, the abstractors were instructed to drop the case from the study.

Claims Data Limitations

With respect to the non-network IPAs and the network IPAs which contract with a large number of medical groups to provide services to its enrollees, it was not feasible, logistically, to access medical record information. This would have required the abstractors to go to numerous sites in order to collect data on a sample of the IPA's patients. The only type of centralized information available for these sites were claims data. Consequently, for three of the study sites, claims data were collected:

- West IPA
- Central IPA
- Atlantic IPA

It is recognized that claims data do not provide the same level of information as do medical records since the focus of this information differs from that of the medical record. Claims data provide information which are used to remunerate physicians for services rendered, and it is not intended to provide an overview of the patient's medical history. Accordingly, limitations to these data for the purposes of the study include:

- Missing data: for some patients in practices where claims data were abstracted, information frequently was missing on the types of office visits, patient background information, office procedures performed, medications ordered, office visits following some surgical procedures, and patient outcome. Also, no data were collected for maternity cases at Atlantic IPA because that practice has a single fee, and as a result does not collect encounter or inpatient information.

- Misleading information: since physicians usually report treatments pursuant to a fee schedule, the actual claim might represent an "embellished" version of the actual service performed; or conversely, might under-report the extent of services. For example, at West IPA, the utilization of services for maternity care appears low. However, this might be a result of the reporting system which allows the physicians to bill the plan by visit, trimester, or by a single, all inclusive fee.

These data limitations mandate caution with respect to comparative analysis across all the practice sites.

Problems Associated with Obtaining the Requisite Sample of Cases

As mentioned in the previous section, a variety of pre-data collection activities were undertaken in order to determine whether a sufficient number of cases for each diagnosis would be available at each practice site. Once the data collectors were on site, however, it was not always possible to obtain the requisite 30 cases for each diagnosis at each practice site. Factors affecting the completion of the full sample included:

- Coding errors which caused the site to initially report a sufficient number of cases but, upon closer inspection, the diagnosis was found not to be present in some of the cases;
- Missing data in the medical records requiring the exclusion of cases from the study;
- Problems in locating the medical records;
- Confounding secondary diagnoses (e.g., alcoholism) which caused the cases to be excluded from the study;
- Other criteria such as patient age (e.g., for pediatric asthma) caused cases to be dropped from the study; and
- Illegible or inconsistent medical records reporting.

When all or combinations of these factors were encountered, the problematic cases were dropped from the study. Replacements were sought for the cases dropped; however, in a number of such practices, the available pool of cases was exhausted for the diagnosis of interest. Further, as was noted in the previous chapter, a number were at the low end of practice-size criterion (i.e., 15 full-time physicians). These sites either had marginal case counts, or if a substantial number of cases were found to be problematic, the case-counts fell below the target

of 30. Finally, in a number of practices, the number of duodenal ulcer cases was less than the target even though the practice met the size criterion. Recent use of the drug Tagamet has substantially reduced the number of confirmed ulcer diagnoses (i.e., physicians typically prescribe the drug when duodenal ulcer is suspected, and if the symptoms disappear, no diagnosis/treatment is given).

Problems Associated with the Data Collection Time Period

The data collection plan called for capturing information on episodes of interest during calendar year 1982. However, in order to obtain the maximum number of complete cases, some data were collected for episodes initiated in 1981 and 1983. For all diagnoses, approximately 88 percent of "first visits" occurred in 1982, 8 percent occurred in 1981, and 4 percent occurred in 1983. Because essentially all of the data were collected on a calendar year basis, there are varying amounts of time for each patient. Further, because of the relatively small sample size, there was concern that the variation due to differences in treatment time would make it difficult to analyze the data for differences associated with organizational characteristics. As such, the analytical data file was constructed containing both the full information available on each patient, and information on equalized time frames (these time frames are presented in Section 5.2 of Chapter 5). However, because the data base cuts off treatment time, some of the data on variation in service delivery will be lost.

END NOTES

- 1/Maternity care cases were screened to eliminate cases in which miscarriage or pronounced premature delivery occurred.
- 2/The on-site coordinator available at each practice site developed sampling techniques specific to the particular site.
- 3/The original design called for 15 group practices in the study, and an expectation of 450 cases per diagnosis; 150 each in HMOs, IPAs, and fee-for-service practices.

CHAPTER 5

RESEARCH DESIGN

The analysis of the data collected during this project falls into two main areas:

- Case Study Reports have been prepared for each practice included in the study. These reports will focus on the market area characteristics and unique features of the site.
- Diagnosis-specific Analysis of Utilization of Services is done with both raw data and data aggregated into standardized units.

A. CASE STUDY REPORTS (AMS)

A Case Study Report has been prepared for each of the practices selected as a site for data collection. The purpose of the Case Study Report is to provide a framework for the interpretation of the analytical results on utilization of services by diagnosis. Each Case Study Report includes a discussion of the following issues:

- market area characteristics
- practice characteristics
- qualitative information

A discussion of the approach used in acquiring the necessary information for the case studies is described below, and the full set of reports is presented in Volume II, Chapter 10 of this document.

Market Area Characteristics

Information on the characteristics of the SMSA selected as a site and data on changes over time in key socioeconomic, demographic, health resources, and health status measures was assembled from several sources.

The primary data used to describe market area characteristics was from the Area Resource File (ARF) which includes data on:

- population
 - age, sex, race distributions
- economic characteristics
 - per capita and household income
 - unemployment rate
 - AFDC/general assistance recipients
 - Medicare prevailing charges
- health resources
 - physicians by specialty
 - other health professions
 - hospitals and hospital beds
 - HMOs
 - nursing homes
- health care utilization
 - hospital admissions, discharges, and inpatient days
 - HMO enrollees
 - obstetrical discharges
 - number of surgical operations
 - nursing home patients
- health professions education
 - medical schools and enrollees
 - resident physicians
 - other professional programs.

The variables available on ARF permit a description of the selected areas. In addition, since many variables on ARF have been reported for more than one year, it is also possible to describe changing patterns of utilization, economic characteristics, etc.

Physician's Practice Characteristics

A discussion of the practice's historical development, past and present utilization experience, recent changes in operating procedures,

relationships with nursing homes, "urgent care" centers and other service providers, the role of the medical director, and other organizational, financial, managerial characteristics has been assembled. The emphasis in this discussion is the identification of any "unique" features of each practice which are thought to affect utilization. The data for this portion of the case study has been drawn primarily from the practice survey conducted by Applied Management Sciences during this project.

Qualitative Information

The perceptions and knowledge of individuals familiar with the market for health services within each selected SMSA was probed in order to develop a greater comprehension of the market. The emphasis in this segment of the case study was on gaining an understanding of the nature and extent of competition among health care providers in each SMSA, special conditions which affect the demand for and supply of health services in the specific market. Qualitative information was obtained in unstructured interviews with knowledgeable individuals in each locale, which typically included:

- HSA staff;
- county medical society;
- local hospital association;
- practice administrators; and
- medical writers for local newspapers.

To the extent possible, these interviews were conducted on site by Applied Management Sciences' staff. If scheduling problems arose, arrangements were made to conduct telephone interviews with the appropriate individuals in order to fill in information not obtained on site.

Preparation of the Case Study Report

The preparation of the Case Study Reports was a major activity during the data collection and preparation phase. Because the Case Study Reports for all city sites were completed prior to the beginning of the analysis of the utilization data, information from the case studies could be incorporated into the analysis of utilization patterns.

The structure of the Case Study Report for each city site followed the general outline:

- Section 1: Market Area Characteristics
- Section 2: Health Resources
- Section 3: Health Services Utilization Patterns
- Section 4: Other General Background
- Section 5: Description of the Practices
- Section 6: Interview Results
- Section 7: Summary and Discussion

The reader is directed to Volume II, Chapter 10 of this document for a presentation of the case studies.

B. DIAGNOSIS-SPECIFIC ANALYSES OF UTILIZATION

The description of utilization of services is divided into two parts: (1) descriptive analysis of the data, and (2) controls for case mix and region.

Descriptive Analysis

The descriptive analysis of utilization patterns in Chapter 7 will be presented as a series of four tables for each diagnosis. Using these tables, differences in utilization across the 14 practice sites can be examined, and systematic patterns can be identified in terms of types of practice (PGP, IPA or FFS), region (Pacific, West, Midwest, Central, and Atlantic), or organizational characteristics (decisionmaking, peer interaction/quality assurance, utilization review, and financial incentives). Classification of the 14 practice sites by organizational characteristics is described in Chapter 6.

The first table will show mean utilization of the following services for each of the 14 sites:

- total office visits
- prescribed medications
- hospital admissions
- laboratory tests
- laboratory profiles
- x-rays
- special procedures (specific to each diagnosis)

Length of hospital stay is missing in about 70 percent of cases and, therefore, is not included in the analysis. In addition, prescribed medication data is missing or inaccurately coded for West IPA, Central IPA and Atlantic IPA. Because data from these three sites is based on insurance claims rather than office medical records, the other variables also may be biased. For example, hospital admissions data is more complete when taken from insurance claims rather than medical records data.

The second table shows mean utilization expressed in standardized units for each of the 14 sites:

- office visits
- prescribed medications
- total ambulatory care
- special procedures
- hospital admissions
- total utilization (including prescribed medications)
- total utilization (excluding prescribed medications)

Standardized units (SU) are used so that different measures of utilization, e.g., an office visit and a prescribed medication, can be expressed in terms of a common unit, often called a numeraire. Calculation of SU in this study is described on page XX. Ambulatory care and total SUs shown on each Table 2 are calculated as follows:

- ambulatory care SU = office visit SU + lab profile SU + lab test SU + x-rays SU + other procedures SU

- total SU (with prescribed medication) = office visit SU + lab profile SU + lab test SU + x-rays SU + other procedures SU + special procedures SU + hospital admissions SU

Because prescribed medication data are missing for three sites, total SU are calculated both with and without prescribed medications.

The third table shows mean values by type of practice, region, and organizational characteristics for the same measures of utilization shown on Table 1.

The fourth table shows mean values of standardized units by type of practice, region, and organizational characteristics for the same measures of utilization shown on Table 2. Because data was obtained on less than the targeted 30 patients per diagnosis per site, these means are weighted by the number of patients at each site. For example, for cholecystitis, there were 26 patient records for Pacific FFS, 10 for West FFS, 20 for Midwest FFS and 21 for Central FFS. Thus, the mean office visits for FFS is calculated as:

$$[(26 * 2.93) + (10 * 2.10) + (20 * 2.52)] / 77 = 2.37$$

On each table, analysis of variance for unequal cell sizes is used to evaluate the statistical significance of differences across sites (Tables 1 and 2) or within categories (Tables 3 and 4). An indication of significance means that one can reject the hypothesis that all the values are the same. It does not necessarily mean that differences between every possible pairing of values are significant.

Regression Analysis

Multivariate regression was used to explore whether the patterns of utilization by practice type or practice characteristics observed in Table 4 remain when patient age and sex as well as practice region are held constant. The calculations are described below and results for each diagnosis are presented in Chapter 7.

The multivariate analysis was conducted separately for each diagnosis in three steps: (1) calculation of expected utilization based on patient data, (2) aggregation of individual patient data into practice site values, and (3) regression analyses using each practice site as the unit of observation.

(1) In the first step patient sex (for pediatric asthma, duodenal ulcer, cholecystitis, and otitis media), age, and geographic region of the practice were used to predict utilization for each patient. The regressions were estimated using all patients as the unit of observation for each diagnosis for which there was complete information. While primary complaint might be expected to help predict utilization, this variable was not included because of a lack of variation among patients. For example, out of 219 ulcer patients, 195 reported mid-epigastric distress, 4 hematemesis, 7 melena, 1 fainting, 6 nausea, and 6 other.

For each diagnosis, regressions were run separately for four dependent variables, office visit standard utilization (SUOV), ambulatory care standard utilization (SUAC), hospital admissions standard utilization (SUHDRG), total utilization standardized units including medications (SUMD) (for asthma), and total utilization standardized units excluding medications (TSU) (for cholecystitis, duodenal ulcer, uterine bleeding and pregnancy). For otitis media, regressions were run only for SUOV and SUAC. These results are shown in Table 5 for each diagnosis.

(2) In the second step, individual patient data on actual utilization and expected utilization (as predicted by the regression in Step 1) is

aggregated on a diagnosis and practice site specific basis. This is done separately for each measure of utilization, e.g., office visits, ambulatory care, hospital admissions, and total care.

$$\text{Adjusted Utilization} = \frac{\sum_{p=1}^n \text{utilization}_p - \text{expected utilization}_p}{\sum_{p=1}^n \text{expected utilization}_p}$$

For each diagnosis this results in a single number for each measure of utilization for each site included in the analysis. By dividing by the sum of expected utilization, the difference between actual and expected utilization is normalized across diagnoses.

(3) In the third step, practice type and organizational factors are examined, using the difference between actual and expected utilization calculated in Step 2, as the dependent variables. These results are shown in Table 6 for each diagnosis.

Three types of diagnosis specific regressions are estimated: practice type only, each organizational factor only, and each organizational factor with practice type.

Practice Type Only

$$\text{utilization} = f(\text{PGP}, \text{IPA})$$

Organizational Factors Only

$$\text{utilization} = f(\text{decisionmaking}=1, \text{decisionmaking}=2)$$

$$\text{utilization} = f(\text{peer interaction}=0, \text{peer interaction}=1, \text{peer interaction}=2)$$

$$\text{utilization} = f(\text{utilization review}=0, \text{utilization review}=1)$$

$$\text{utilization} = f(\text{financial incentives}=-2, \text{financial incentives}=0, \text{financial incentives}=1)$$

Practice Type and Organizational Factors

utilization = f(PGP, IPA, decisionmaking=1, decisionmaking=2)

utilization = f(PGP, IPA, utilization review=0, utilization review=1)

utilization = f(PGP, IPA, financial incentives= -2, financial incentives =0, financial incentives=1)

C. TIME PERIOD DEFINITIONS

Data collection was originally conducted for calendar year 1982. However, the Project Officer and Advisory Committee concluded that a one-calendar-year time period was inappropriate for analysis. A calendar year's visits for one patient may include several different episodes of illness while for patients initially seen near the end of the year, follow-up visits will be lost. In addition, for some patients whose first office visits occurred after the beginning of the year, data was collected for less than a full year. Therefore, time periods for episodes of illness were developed by the Project Officer and AMS to correct this problem.

For otitis media, episodes were differentiated by a lapse of at least six weeks between the provision of service. So, if a patient has three visits each 2 weeks apart and then another visit 8 weeks later, only the first three count as part of the episode. A maximum of 3 episodes per patient were documented for this study. Each episode of illness is defined as one time period. For maternity care, all of pregnancy and delivery is considered to be one episode with data collection keyed to the delivery date. For the remaining four diagnoses, a "medical course of treatment," T1, and "follow-up," T2, period were defined as follows:

<u>Diagnosis</u>	<u>Medical Course of Treatment Period (T1)</u>	<u>Follow-up Period (T2)</u>
Duodenal Ulcer	2 months	3 months
Cholecystitis	2 months	2 months
Uterine Bleeding	2 months	2 months
Pediatric Asthma	3 months	4 months

Tables 5.1 - 5.6 show the total number of patient records that were abstracted at each site by diagnosis and the cases lost when recoding from a calendar year into episodes. The first column of Tables 5.1 - 5.6 shows the number of observations per site for which data on total utilization for the calendar year was collected. For Tables 5.1 - 5.5, the second column shows the number of observations for which the initial episode, T1, data is available. The differences between these columns represent those patient records that didn't meet the time criteria, a total of 777 cases. The third column shows the number of observations for the follow-up period T2, and for otitis media only, the fourth column shows the number of observations for T3. The differences between the initial period, T1, and follow-up, T2 or T3, are those patients who either did not receive follow-up care or for whom data collection started too late in the calendar year for follow-up period data to be available. In the analysis presented in Chapter 6, overall utilization will be used for maternity cases and T1 utilization for the other five diagnoses.

Because of this recoding and because of problems achieving the target 30 patients, the total number of patients at each practice site was lower than the planned 30 patients in 31 of a possible 84 instances. Sites with fewer than 10 patients were dropped from the analysis.

Table 5.1

Number of Observations Overall and by Time Period for Cholecystitis

	Observations Total	Observations T1	Observations T2
Site			
Pacific PGP	1	1	0
Pacific IPA	15	15	7
Pacific FFS	30	27	17
West PGP	23	7	0
West IPA	29	21	8
West FFS	28	10	6
Midwest PGP	30	28	3
Midwest IPA	24	17	7
Midwest FFS	28	20	1
Central PGP	26	21	11
Central IPA	26	20	11
Central FFS	25	21	7
Atlantic PGP	1	1	0
Atlantic IPA	10	8	2
Total	296	217	80

Table 5.2

Number of Observations Overall and by Time Period for Duodenal Ulcer

	Observations Total	Observations T1	Observations T2
Site			
Pacific PGP	3	3	2
Pacific IPA	5	5	2
Pacific FFS	28	25	10
West PGP	30	25	7
West IPA	30	27	10
West FFS	30	10	3
Midwest PGP	28	24	14
Midwest IPA	13	7	2
Midwest FFS	30	19	7
Central PGP	27	21	12
Central IPA	30	26	16
Central FFS	27	26	12
Atlantic PGP	3	2	1
Atlantic IPA	4	3	2
Total	288	223	100

Table 5.3

Number of Observations Overall and by Time Period for Otitis Media

	Observations Total	Observations T1	Observations T2	Observations T3
Site				
Pacific PGP	30	28	9	3
Pacific IPA	30	28	18	6
Pacific FFS	30	29	20	8
West PGP	30	30	16	5
West IPA	30	30	14	5
West FFS	30	6	3	1
Midwest PGP	30	24	2	1
Midwest IPA	30	28	6	2
Midwest FFS	30	28	5	1
Central PGP	30	29	9	2
Central IPA	31	29	5	1
Central FFS	29	28	2	0
Atlantic PGP	30	24	6	4
Atlantic IPA	30	25	3	0
Total	420	366	118	39

Table 5.4

Number of Observations Overall and by Time Period for Pediatric Asthma

	Observations Total	Observations T1	Observations T2
Site			
Pacific PGP	30	18	9
Pacific IPA	30	20	9
Pacific FFS	29	25	13
West PGP	30	24	10
West IPA	29	29	20
West FFS	30	17	14
Midwest PGP	30	21	11
Midwest IPA	30	16	3
Midwest FFS	30	12	3
Central PGP	30	13	6
Central IPA	30	20	12
Central FFS	30	22	8
Atlantic PGP	5	4	1
Atlantic IPA	30	18	3
Total	393	259	122

Table 5.5

Number of Observations Overall and by Time Period for Uterine Bleeding

	Observations Total	Observations T1	Observations T2
Site			
Pacific PGP	30	25	3
Pacific IPA	30	28	12
Pacific FFS	30	26	2
West PGP	30	21	2
West IPA	30	26	5
West FFS	30	10	4
Midwest PGP	23	22	11
Midwest IPA	21	11	0
Midwest FFS	30	24	1
Central PGP	30	24	10
Central IPA	30	27	14
Central FFS	30	28	11
Atlantic PGP	19	11	3
Atlantic IPA	11	9	3
Total	374	292	81

Table 5.6

Number of Observations Overall and by Time Period for Pregnancy

Site	Observations Total
Pacific PGP	30
Pacific IPA	30
Pacific FFS	30
West PGP	30
West IPA	30
West FFS	29
Midwest PGP	30
Midwest IPA	15
Midwest FFS	20
Central PGP	30
Central IPA	30
Central FFS	30
Atlantic PGP	30
Atlantic IPA	0
Total	364

D. STANDARDIZED UTILIZATION (AMS)

A methodology has been developed which aggregates specific services into a single measure of "standardized" utilization by converting units of specific services into a common unit of measure.

Previous comparative studies of total utilization in the HMO and FFS practice settings have relied upon data on premium costs plus out-of-pocket payments for services received by HMO enrollees and total charges for all health services provided to FFS patients (e.g., Luft, 1978; Wersinger and Sorenson, 1980). For the present study, however, this approach is not feasible since the utilization data to be compared are those services associated with the diagnosis and treatment of selected diagnoses, a subset of total annual utilization. Therefore, a methodology was developed for this study which transforms the diagnosis-specific treatment patterns across the alternative practice settings into a standardized measure of utilization.

The approach developed to permit aggregation of diverse medical services into a common measure of standardized utilization has four components:

1. ambulatory services;
2. inpatient services;
3. surgical services; and
4. conversion factors to permit aggregation of (1) through (3).

Each of these components and an example of the process through which one patient's utilization is converted into an aggregate measure of standardized utilization are discussed in this section.

Measuring Standardized Utilization of Ambulatory Services

The calculation of the standardized utilization of ambulatory services is based upon the 1974 Edition of the California Relative Value Studies (CRVS). The reasons for selecting the CRVS are detailed below.



Selection of a Relative Value Scale

The key elements of any relative value scale are its terminology, its coding system, and the relative values assigned to each procedure. The terminology system describes the individual medical procedures defined by the RVS. The coding system assigns a unique code number to each procedure described. The relative value assigned to the procedure ranks the procedure relative to other procedures for the purposes of billing. Relative values are not prices, but can be easily converted to a fee schedule once a numeraire procedure is defined and priced. For example, if a brief office visit is assigned the unitary relative value and is priced at \$20 per visit, then an extended office visit with a relative value of 1.5 will command a price of \$30 per visit ($1.5 \times \20).

Three major procedural terminology systems have been developed and are currently in use in the payment systems of Medicare, Medicaid, other Federal programs, Blue Cross-Blue Shield Plans, and other private insurance companies. The three systems are:

- the Blue Shield Coding and Nomenclature Manual, developed by the National Association of Blue Shield Plans;
- the California Relative Value Studies (CRVS), developed by the California Medical Association; and
- the Current Procedural Terminology (CPT), developed by the American Medical Association.

The CPT does not assign relative values to the procedures listed; therefore, the CPT cannot be used by this study.

In a study of these procedural systems conducted by Moshman Associates, Inc., (1978) it was pointed out that the CRVS lists substantially more procedures than the Blue Shield Manual. The reasons for this variation were reported to be related to the genesis of the system. The CRVS was developed for the purpose of providing a common nomenclature for all medical procedures, whereas the Blue Shield Manual was developed from the fee schedules of member Blue Shield Plans. The Blue Shield Manual was not intended to provide precise descriptions of every technical procedure used by physicians but, rather, was to be used for reimbursement purposes only. Each system, however, lists anywhere from 4,000 to 6,000 procedures.

With respect to coding systems, the CRVS utilizes a five-digit coding scheme for identifying and categorizing procedures, whereas the Blue Shield Manual uses a four-digit numerical coding scheme. These coding systems are designed for the purpose of categorizing different types of services (e.g., medical; surgery, anesthesiology, radiology, pathology). The growth over time in the number of coded procedures in both systems has been substantial. The number of procedures in the Blue Shield Manual increased 89 percent from 1962 to 1978. Increases in the CRVS were 200 percent over a roughly comparable time period.

The third key element in any relative value study is the relative value assigned to each procedure. Both the CRVS and Blue Shield Manual have included relative values along with their procedural terminology and coding systems. In both cases, relative values were initially assigned on the basis of actual physician fees charged for the various services described in the RVS terminology. For example, assume that the numeraire procedure is the brief office visit which commands an average fee of \$20 per visit. If the average fee for an extended office visit is \$30 per visit, the fee-based relative value assigned to the extended visit is $1.5 = \$30/\20 .

Of the major terminology systems and relative value scales currently in use, the California Relative Value Studies system (CRVS) is clearly superior to the Blue Shield manual for the purposes of this study. The Blue Shield manual does not provide precise descriptions of the technical procedures used by physicians; therefore, the Blue Shield system may be more difficult to apply to medical records data.

The initial version of the CRVS published in 1956 included about 1,800 procedures divided into four sections: medicine, surgery, radiology and pathology. As subsequent revisions were published, the coding and structure of the CRVS were modified. By the final edition the number of procedures had increased to almost 5,500. In addition to the number of procedures, later versions of the CRVS also included listing of special services and billing procedures and modifiers, to indicate services and circumstances which might affect the fee usually charged. These indicators are to be used in combination with the regular procedure codes, and have the effect of multiplying the number of possible codes which can be reported.

As the size and detail of the CRVS increased, so did its acceptance and use as a guide for physician reimbursement, both within and outside of California. The 1964 CRVS, for example, was adopted with little modification by several other state medical societies. In addition, shortly after the 1969 CRVS was introduced, a number of Medicare carriers petitioned the Social Security Administration to be allowed to use the CRVS coding and terminology for their Medicare Part B activities. Moreover, many state societies and other groups adopted parts of the CRVS for local use, or use other studies based directly on the CRVS.

In recent years, both the Justice Department and the Federal Trade Commission have filed antitrust complaints against several professionally sponsored RVSs, on the basis that they represent per se violations of the prohibition against price fixing. In November of 1977, the California Medical Association entered into an agreement with the Federal Trade Commission to:

- Cease publication and circulation of the CRVS;
- Cease suggesting that conversion factors can be calculated for use with existing editions of the CRVS;
- Cease advising government or third parties to use any existing version of the CRVS;
- Cancel and seek to withdraw all editions of the CRVS; and
- Request that outstanding copies of the CRVS be returned.

In return, the CMA admitted no guilt or wrong-doing.

The agreement between the California Medical Society and the FTC has prevented updating of the CRVS. This raises the issue of whether or not the CRVS corresponds well to the current fee structure. The Urban Institute is currently conducting research for the Health Care Financing Administration (HCFA) which addresses this issue (Hadley, 1983). As part of their initial research into alternative methodologies for constructing an RVS, the Institute constructed fee-based relative value scales using fee data from three different sources: the HCFA Prevailing Charge File (1980), the Urban Institute's California Medicare-Medicaid Claims File (1978), and the Health Insurance Association of American (HIAA) Surgical Prevailing Charge File (1978). An RVS was generated for each data base using mean, median, 75th percentile, and 90th percentile prevailing, billed, or allowed charges. Initial investigations using the HCFA file

are underway. Pearson and Spearman rank-order correlation matrices were calculated for the HCFA based RVSS, and including the 1974 CRVS. These preliminary data indicate that the 1974 CRVS is highly correlated with RVSS based on more recent fee data.^{1/} Therefore, this study will use the established California Relative Value Study as the basis for development of standardized utilization measures for ambulatory and physicians' services.

^{1/}The initial results are quite striking. The lowest correlation coefficient across all possible combinations of HCFA fee-based RVSS is .987. The range of correlation coefficients for the HCFA/CRVS comparisons is .905 to .926 for the Spearman rank order correlations, and .961 to .981 for the Pearson correlation coefficients. The Urban Institute has also compared a limited number of smaller RVSS constructed for procedures common to all three data files. These preliminary findings indicate that correlations of the RVSS across data sets are also in the .90 range. Both results suggest that the standardized utilization comparisons between prepaid and fee-for-service practice setting will not be sensitive to the RVS employed.

Application of the CRVS to Measuring Standardized Utilization of Ambulatory Services

For this study, detailed diagnosis-specific data have been abstracted from individual patients' records for the following categories of services:

- physician office visits by visit type and provider specialty
- radiologic procedures
- laboratory tests
- other procedures

The specific application of the CRVS to each of these service categories differs. In this section, we describe the methodology used to calculate the standardized utilization of each subcategory of ambulatory services. The conversion factors necessary to aggregate each subcategory to a measure of total standardized utilization of ambulatory services are also presented.

Conversion Factors. The CRVS is divided into five sections: medicine, pathology, radiology, surgery, and anesthesia. Relative values from each section are not directly comparable across sections, but must be converted to a common scale. After several alternative conversion systems were investigated conversion factors developed in the University of Washington's evaluation of Safeco's United Health Care Plan were selected for use in this study. These conversion factors are listed in Exhibit 5.1. The Safeco study utilized fee data for the Seattle area to calculate the mean dollar-to-unit ratio for each of the six sections of the CRVS for inpatient and outpatient services. The current study has converted the Safeco dollar-per-unit values into conversion factors for each sub-scale in the CRVS by reducing the Safeco values by a factor of 10. The outpatient Safeco conversion factors were used in these calculations with the exception of surgical procedures. The result is an RVS which is unique to this study. A complete listing of this RVS is provided in Appendix C which includes relative values for hospital services to be discussed below.

Physician Services. Data on physicians' services indicate whether the visit was brief/minimal/limited, intermediate, or extended in length. In addition, the specialty of the provider has also been

EXHIBIT 5.1: MEAN DOLLAR-PER-UNIT RATIO, SEATTLE AREA BLUE CROSS CLAIMS
BY PROCEDURE TYPE AND INPATIENT/OUTPATIENT STATUS OF CLAIM

Procedure Type	Claim Type	
	Outpatient	Inpatient
Medical	2.61*	3.58
Anesthesia	27.03	36.93
Surgical	67.46	75.45*
X-Ray	5.83*	8.46
Lab	0.65*	2.13
Administrative	0.98	1.31

*Denotes conversion factors used to construct conversion factors for this study (i.e., reduced by a factor of 10, for example, the RVS used for Lab is .065).

Source: Richardson, et al., (1982), p. 104.

collected. Thus, the application of the CRVS to each of these visits is straightforward for the length of visit since a separate CRVS value is available for the B/M/L, Intermediate, and Extended physician visit. However, the CRVS values for physician office visits by type of visit do not reflect the specialty of the physician. Since it can be assumed that an office visit with a specialist represents more standardized units of service than a comparable visit to a primary care physician, a methodology was developed which inflates the RVS value for primary care physician visits into an RVS value for specialists. Primary care physicians include general practitioners, family practice physicians, and pediatricians. Internists are classified as specialists if the patient is referred to the internist by a primary care physician. If the internist is the physician providing the initial office visit or if the patient is referred to the internist by another specialist, then all visits to the internist are weighted as primary care visits.

First, the RVS for the primary care physician visit was computed by multiplying the CRVS weight for the type of visit (found in Appendix B) by the modified Safeco conversion factor (explained above) found in Exhibit 5.1. The conversion factor between primary care visits and specialist visits was then computed based on data from the Medicare Directory of Prevailing Charges (1979). The ratio of specialists' charges to general practice charges for eight different types of office visits was calculated in each of the five regions used in this study. The grand mean ratio across all eight visit categories was then calculated. The RVS for all types of primary care physician visits were then inflated by the grand mean average ratio. The Prevailing Charge data, the ratios of Prevailing Charges by type of visit, and the grand mean average ratio are provided in Exhibit 5.2 (the region specific ratios are included for information purposes only). The RVS values for specialist visits which reflect the grand mean conversion factor listed in Exhibit 5.2 are presented in Appendix C.

Procedures. In order to reduce the volume and detail of the data set to a workable analytic data file, only a few diagnosis-specific procedures have been coded for individual analysis (e.g., amniocentesis and sonograms for maternity care). All other individual procedures



EXHIBIT 5.2: GRAND MEAN CONVERSION FACTOR FOR SPECIALIST VISITS

Region and Type of Office Visit	Prevailing Charges		
	Specialist	General Practice	Ratio
Region 1			
Initial limited	35.00	30.00	1.167
Initial comprehensive	71.30	59.89	1.191
Minimal follow-up	10.00	8.40	1.190
Brief follow-up	14.26	12.83	1.111
Limited follow-up	17.11	14.26	1.120
Intermediate follow-up	18.50	18.00	1.028
Extended follow-up	29.95	27.00	1.109
Complete follow-up	49.91	45.00	1.109
		Mean ratio:	1.128
Region 2			
Initial limited	35.00	22.50	1.556
Initial comprehensive	50.00	37.50	1.333
Minimal follow-up	6.00	5.00	1.200
Brief follow-up	10.70	8.60	1.244
Limited follow-up	12.00	10.00	1.200
Intermediate follow-up	15.00	12.00	1.333
Extended follow-up	20.00	15.00	1.250
Complete follow-up	42.00	30.00	1.400
		Mean ratio:	1.315
Region 3			
Initial limited	49.90	44.20	1.129
Initial comprehensive	57.00	50.00	1.140
Minimal follow-up	14.30	14.30	1.000
Brief follow-up	14.30	14.30	1.000
Limited follow-up	14.30	14.30	1.000

EXHIBIT 5.2: GRAND MEAN CONVERSION FACTOR FOR SPECIALIST VISITS (Continued)

Region and Type of Office Visit	Prevailing Charges		
	Specialist	General Practice	Ratio
Region 3			
Intermediate follow-up	20.00	15.00	1.333
Extended follow-up	25.00	20.00	1.250
Complete follow-up	42.80	25.00	1.712
		Mean ratio:	1.196
Region 4			
Initial limited	40.00	25.00	1.600
Initial comprehensive	40.00	25.00	1.600
Minimal follow-up	14.30	11.30	1.265
Brief follow-up	14.30	11.30	1.265
Limited follow-up	14.30	11.30	1.265
Intermediate follow-up	30.00	11.30	2.655
Extended follow-up	30.00	21.30	1.408
Complete follow-up	40.00	25.00	1.600
		Mean ratio:	1.582
Region 5			
Initial limited	15.00	15.00	1.000
Initial comprehensive	49.90	45.00	1.109
Minimal follow-up	14.30	14.00	1.021
Brief follow-up	14.30	10.00	1.430
Limited follow-up	15.00	15.00	1.000
Intermediate follow-up	15.00	15.00	1.000
Extended follow-up	49.90	45.00	1.109
Complete follow-up	49.90	45.00	1.109
		Mean ratio:	1.097
		GRAND MEAN RATIO:	1.264

Note: Only the Grand Mean Ratio was used as a conversion factor. Region-specific mean ratios are included for informational purposes only.

recorded on the abstracting form have been aggregated into the following categories: profile laboratory test, individual laboratory test, radiologic procedures, and other procedures. No single CRVS value can be applied to units of service from the aggregated categories. To address this problem, diagnosis-specific and practice-specific average RVS values have been calculated for each aggregate category from hand-tabulated data.

The average practice-site specific RVS value for an aggregated category of service, such as radiologic procedures, for a specific diagnosis is calculated using the following formula:

$$ARVS_{Rij} = CR \cdot \frac{\sum_k (Q_{ijk} \cdot CRVS_k)}{\sum_k Q_{ijk}}$$

where:

1. $ARVS_{Rij}$ is the average relative value for radiologic procedures, denoted R, in the jth practice for the ith diagnosis;
2. Q_{ijk} is the total number of units of the kth radiologic procedure summed across all patients in practice j for diagnosis i;
3. $CRVS_k$ is the CRVS value for the kth radiologic procedure (see Appendix B); and
4. CR is the conversion factor which translates CRVS radiology units into the RVS scale used in this study (see Exhibit 5-1.)

A similar approach has been used to calculate the average RVS values for laboratory profiles, individual laboratory tests, and "other" procedures. An example of these calculations for Cholecystitis for Pacific FFS, Pacific PGP and Pacific IPA is provided in Appendix A. The CRVS weights used in these calculations are listed in Appendix B. The ARVS values computed in Appendix A can be found under the appropriate headings in Appendix C.

The individual patient's standardized utilization of aggregated radiologic procedures is given by:

$$RADSU_{ijl} = ARVS_{Rij} \cdot \sum_k Q_{ijk} l$$

where:

1. $RADSU_{ij}$ is the standardized utilization of aggregated radiologic procedures for patient number i , with diagnosis i , in practice j ;
2. $ARVS_{Rij}$ is the average relative value for aggregated radiologic procedures (denoted by R) for diagnosis i , in practice j (found in Appendix C); and
3. $\sum Q_{ijk}$ is the total number of k th radiologic procedures provided to patient number i , for diagnosis i , in practice j (contained in the data file for each patient).

Selected Procedures. This study has selected procedures for individual analysis for each of the six diagnoses under study. These procedures are listed in Exhibit 5.3: In calculating standardized utilization, the procedures listed in Exhibit 5.3 are weighted individually using the appropriate CRVS value and conversion factor. Appendix B lists the CRVS values for each of these procedures which reflect the physicians' services component associated with the procedure. Any utilization of inpatient services associated with the procedures listed is converted indirectly into standardized units of service through either the DRG or length of stay methodologies described below.

Prescription Drugs. The CRVS does not provide relative values for prescription medications; therefore, an alternative method of weighting prescriptions for inclusion in the standardized utilization calculations was developed. This methodology consisted of determining the two most frequently prescribed medications for each of the six study diagnoses. A diagnosis-specific RVS value was calculated based on a sample of prices and a conversion factor. The cost to the pharmacist of each prescription drug was obtained from the Health Care Financing Administration's Maximum Allowable Cost study, and these amounts were increased by a standard "markup" factor to produce the prescription price. The weighted average based on the quantities reported was used in calculating the RVS for prescriptions, for each diagnosis. The RVS values are presented in Appendix F.

An Example of Standardized Utilization Calculations

In this section we present a hypothetical patient from Pacific IPA with a diagnosis of cholecystitis and detail the standardized utilization

EXHIBIT 5.3: PROCEDURES SELECTED FOR INDIVIDUAL ANALYSIS BY DIAGNOSIS

Diagnosis	Procedure
Maternity Care	Amniocentesis, Sonograms, Caesarean Sections
Cholecystitis	G.I. Series, Cholecystography, Surgery, Fiberoptic Examination
Duodenal Ulcer	G.I. Series, Fiberoptic Examinations
Pediatric Asthma	Skin Patch Tests, De-Sensitization Injections
Otitis Media	Myringotomy
Uterine Bleeding	Dilation and Curettage, Hysterectomy

Note: The procedure myringotomy was performed on only two out of 199 otitis media patients so this procedure was dropped from the analysis

methodology as it applies to this patient's utilization of all services. These calculations are summarized in Exhibit 5.4.

An individual's standardized utilization of services is the sum across all services of the product of units of service per patient year and the corresponding relative value per unit of service from Appendix C. The patient's utilization profile is indicated in the first two columns of Exhibit 5.4 which describe the services used and list the quantity of each service consumed during the patient-year. The third column lists this study's RVS units per unit of service. RVS units are the product of the CRVS relative value for the service and the conversion factor which translates the units of measure from each of the CRVS sections into an arbitrary common unit of measure. The final column lists the total SU units for each service or aggregated service categories listed.

For example, brief, minimal, or limited (B/M/L) visits to a general practitioner have an average CRVS value of 3.7 (i.e. $2.4 + 3.5 + 5.2 = 11.1$; $11.1/3 = 3.7$). The conversion factor for CRVS medical service units is .261 (see Exhibit 5.1;) therefore, the RVS units per B/M/L visit to a GP is $(3.7)(.261) = .966$. Since this procedure is the numeraire, there is no additional factor required to convert RVS units to SU units. The conversion factor between charges for specialists and general practice visits is 1.264 (see Exhibit 5.2;) therefore, the RVS for B/M/L specialists visits is $(.966)(1.264) = 1.221$. Since the patient made four visits, the number of SU units of service is 4.884.

To determine the patient's Individual Laboratory Test SU units of service, we would multiply the ARVS for individual laboratory tests for Pacific IPA (calculated in Appendix A and listed in Appendix C) by the number of tests provided to the patient. Thus, three laboratory tests multiplied by .488 RVS units yields 1.464 S.U. units. The total SU units for visits and procedures is 27.292 units.

In our example, the number of SU units for surgery, 64.887, is calculated by multiplying the average CRVS weight (see Appendix B) for Cholecystitis surgery (i.e., the average for Choleystostomy, 7.45;

EXHIBIT 5.4: AN EXAMPLE OF STANDARDIZED UTILIZATION (SU) CALCULATIONS FOR
A CHOLECYSTITIS PATIENT IN PACIFIC IPA

Services Description	Units of Service	RVS Units Per Unit of Service	SU Units of Service
<u>Office Visits</u>			
B/M/L* GP Visits	1	.966	.966
B/M/L Specialist Visits	4	1.221	4.884
Intermediate Specialist Visits	1	2.145	2.145
<u>Aggregated Procedure Categories</u>			
Laboratory Profiles	1	1.157	1.157
Individual Laboratory Tests	3	.488	1.464
Radiologic Procedures	2	7.838	15.676
Prescription Medications	2	.500	<u>1.000</u>
AMBULATORY AND PHYSICIANS' SERVICES SUBTOTAL			27.292
<u>Special Procedures</u>			
GI Series	1	5.305	5.305
Cholecystography	1	3.498	3.498
Surgery**	1	64.887	<u>64.887</u>
SPECIAL PROCEDURES SUBTOTAL			73.690
<u>Hospital Services</u>			
Admission (DRG)	1	238.100	238.100
TOTAL (DRG METHOD)			339.082

*B/M/L: Brief, minimal, or limited

**Physicians' services only

Cholecystectomy, 8.2S; Choledochostomy, 10.1S) by the conversion factor for inpatient surgery, 7.545 (see Exhibit 5.1). The standardized utilization of special procedures for our hypothetical patient is 73.690 SU units.

The standardized utilization of hospital services detailed in Exhibit 5.4 will be discussed in the following section.

Measuring Standardized Utilization of Hospital Services *

Data on hospital services utilization are abstracted from medical records data available either at the physicians' practice or, in the case of some IPA-HMOs, at the HMO's administrative offices. The quality and detail of these data are uneven across services and across practice sites. Reliable data are available on admissions and on inpatient physicians' services selected for special analysis, such as Caesarean section for maternity care. Data on inpatient days are less reliable. Across all practice sites, the percentage of medical records with a recorded hospital admission which also include data on inpatient days ranges between 66 percent for maternity care to 80 percent for uterine bleeding and duodenal ulcer. There is an even greater problem for this study, however, because the reporting of inpatient days varies across practice sites. For example, the percentage of maternity care medical records with a reported admission which also report inpatient days ranges between 13 percent for one IPA-HMO to 100 percent for another IPA-HMO.

Given the quality and detail of data on the utilization of hospital services, it is not feasible to use a relative value scale to calculate a measure of standardized utilization of hospital services in a manner comparable to the ambulatory services calculations. Rather, standardized units (SU) of service per admission should be calculated using data on average costs per admission for Diagnosis Related Group (DRGs).

* Note: Because data on length of hospital stay (LOS) is missing for so many cases, the discussion of a LOS measure of standard utilization of hospital services is omitted.

These estimates should be added to the standardized utilization of ambulatory services and selected physicians' services, (e.g. amniocentesis, Caesarean section, and sonograms for maternity care) to obtain estimates of total standardized utilization.

The DRG approach to calculating the standardized utilization of hospital services "weights" each hospital admission using an RVS value based on Diagnosis Related Group (DRG) average costs per discharge. The methodology for calculating the diagnosis-specific RVS is discussed below. The DRG data we have chosen to use were developed by the DRG Project of the New Jersey State Department of Health. The New Jersey DRG-specific cost per discharge for an individual hospital is the product of the hospital's reported direct patient care cost per discharge in 1979 and an indirect cost mark-up factor. The 1979 cost-per-discharge data are adjusted annually for inflation and other factors. The hospital's indirect cost mark-up factor reflects the hospital's ratio of total costs to direct patient care costs. The New Jersey DRG categories correspond to the DRG categories defined by the Health Care Financing Administration.

Appendix D presents the average adjusted DRG rates used to calculate the diagnosis-specific RVS weights per admission used in this study. First, all DRG categories which may be associated with the ICD-9 diagnoses under study were identified. These categories are listed in Appendix D. Second, the hospital specific, DRG-specific cost data from New Jersey were averaged across all hospitals. These average costs by DRG category are also listed in Appendix D. Next, the average costs by DRG were averaged across all DRG categories associated with the diagnosis under study. Finally, the RVS weight assigned to each admission by diagnosis is set equal to the average DRG cost by diagnosis reduced by a factor of 10 to conform with the ambulatory services conversion factors discussed previously. The RVS weights per admission by diagnosis used to calculate hospital services' standardized utilization in this study are listed in Exhibit 5.5.

EXHIBIT 5:5 STANDARDIZED UTILIZATION UNITS PER DISCHARGE BY ICD-9
DIAGNOSIS

ICD-9 Diagnosis	Standardized Utilization Units
Pediatric Asthma	104.009
Duodenal Ulcer	386.671
Non-specific Uterine Bleeding	224.669
Acute Otitis Media	104.215
Acute and Chronic Cholecystitis	259.733
Maternity Care (Vaginal Delivery)	153.493
Maternity Care (Caesarean Section)	234.540

There does not exist a simple correspondence between the ICD-9 diagnosis selected for study and the DRG categories listed in Appendix D. An individual with an ICD-9 diagnosis selected for study may fall into one of several DRGs if hospitalized. Conversely, an inpatient within a particular DRG may have one of several ICD-9 diagnoses. In order to calculate precisely the average cost per hospital admission per patient within an ICD-9 diagnostic category, data would be required on the proportion of individuals hospitalized with a particular ICD-9 diagnosis which fall into each applicable DRG. Using these proportions as weights, a precise weighted average cost per discharge by ICD-9 diagnosis could be calculated. Unfortunately, these data are not available.

The DRG method of calculating the standardized utilization of hospital services may introduce biases into comparisons of standardized utilization of hospital services across practice sites. The DRGs weights used here reflect the average intensity (cost) of services per day and average length of stay in the fee-for-service setting. Two types of error are introduced. First, the DRG method will overstate savings associated with lower hospital admission rates. Patients with marginal indications for hospitalization may be assumed to have less costly hospital stays than the average inpatient with the same diagnosis. Therefore, estimating potential saving based on average cost will overestimate actual savings which may be associated with the lower hospital admission rates which have been observed in past studies. Stated differently, HMO patients who are hospitalized may be more seriously ill on average; thus requiring a higher than average intensity of service per admission. The DRG method assigns a RVS weight per admission based on average intensity per admission, possibly understating the intensity of services consumed by HMO patients. Given the numerous previous findings that HMOs tend to reduce admissions relative to the fee-for-service setting, the DRG method will tend to favor the HMO practice settings. The second type of error tends to offset the potential bias in favor of the HMO practice setting. The DRG method will not capture any savings associated with a lower intensity of hospital services delivered to HMO patients relative to comparable fee-for-service patients. For diagnoses which typically require hospitalization, such as maternity care, this latter factor may dominate and the DRG method will be biased against HMOs.

An Example of Standardized Utilization Calculations Revisited

Exhibit 5.4 presents the utilization of hospital admissions and inpatient days by our hypothetical patient. These utilization data are converted to SU units as indicated. Our hypothetical patient utilized one admission. The RVS weight per admission for cholecystitis is 238.100 standardized units of service. Our hypothetical patient also used 73.690 standardized units of selected procedures and 27.292 units of ambulatory services. Therefore, total standardized utilization by our hypothetical patient was 339.082 SU units using the DRG method.

CHAPTER 6

CLASSIFICATION OF PRACTICE SITES AND CASE STUDIES

During this project, two major sets of activities have been undertaken:

- (1) Site visits have been conducted at 14 HMOs and fee-for-service group practices to collect information on organizational and market area characteristics which may influence utilization patterns.
- (2) Use data from medical records or claims records of patients with selected diagnoses at each of the 14 practices have been collected.

The purpose of this chapter is to use the information collected during the site visits to the HMOs and fee-for-service medical groups to classify plans by the presence and extent of selected characteristics (i.e., decisionmaking, peer interaction/quality assurance, utilization review, financial incentives, and market area characteristics) which are believed to affect utilization of services. This classification scheme serves two purposes:

- (1) It results in the construction of classifying variables which can be used for the empirical analyses of the use data to be conducted at some future time.
- (2) It provides an initial descriptive profile of each medical group and HMO visited with respect to the variables of interest.

In addition to the classification of practices, narrative case studies are included in Volume II, Chapter 10. The purpose of these detailed case studies is to provide a background and framework for interpretation of the findings of the empirical analyses. This is particularly critical since this study is a first attempt to select specific organizational and

market characteristics and relate them to observed patterns of use. Earlier studies which compared use of services by patients in the fee-for-service sector and HMOs did not differentiate structural variables among fee-for-service practices as a group or HMOs as a group. Similarly, studies which have compared use of services in PGP-HMOs and IPA-HMOs did not differentiate structurally among PGPs as a group or IPAs as a group. As will be seen in the sections which follow, there are substantial differences within and among these organizational forms. However, since this is an initial attempt to examine these issues, it is possible that there are characteristics, other than the ones selected, which influence use patterns. Therefore, the narrative case studies were developed to provide the necessary background detail to interpret and refine the empirical analyses.

6.1 CONSIDERATIONS AND LIMITATIONS

The development of this study has occurred over a particularly extended period of time. As a result, there has been occasion to examine from several perspectives the information which was collected and which might have been collected. In this section, some issues of importance to understanding both the case studies and the classification of practices are discussed.

Changes in the Classification Variables

Earlier in the study, it was thought that quality assurance (QA) and utilization review (UR) were two aspects of the same activity. During the site visits to the 14 practice organizations, it gradually became clear that QA may, in part, act as UR but that is seldom its specific function. QA activities are designed to assure that appropriate and acceptable standards of care are met; this may involve identification of overutilization, underutilization, or inappropriate treatment modes. UR is specifically focused in most practices, on the quantity of services used; the purpose of these

activities is most often to permit a practice to identify problems of excessive use, although in HMOs which capitate medical providers, UR may also focus on identifying chronic underutilizers. Because this distinction became sharply evident as the site visits were conducted, it was determined that QA and UR should be separated and each became a classifying variable for this study.

Further refinement of the QA classifying variable was undertaken in response to understanding that quality assurance was a formalization of peer interaction within a medical practice. Where the physicians in a group interact professionally on a continual basis, there is a process of informal QA being conducted at all times. Practices which participate in teaching activities with a medical school or residency program, which sponsor and encourage physician members to participate in Continuing Medical Education, or which otherwise conduct the practice in ways which assure that member physicians review each other's decisions and frequently consult with each other on practice decisions, are examples of strong peer interaction environments. Strong peer interaction combined with strong formal QA mechanisms indicate practices which may be expected to exhibit less within-practice variation in use patterns.

These refinements of the basic model developed in Chapter 5 are reflected in the classification variables described in the section which follows this discussion.

Limitations of the Case Studies

The site visits were conducted with an expectation that a highly structured questionnaire would be administered. This questionnaire was administered at each practice visited. (Copies of the questionnaire can be found in Appendix G. Additionally, in most cases, substantially more information was volunteered than was elicited from the formal questionnaire. Much of this additional information was of interest for the issues under study. However, the nature and range of additional information varied widely across the practices visited. After considering the variety of information collected, and discussions with the Project Officer, a decision was made to include the full range of information collected in the case study report on each practice. The consequence of this decision is that the case studies vary in depth and content. This additional information may be helpful in suggesting other types of information that should be collected in future, similar studies.

The questionnaire information was elicited for 1982--the year for which the utilization data was primarily collected. Thus, the case studies represent a "snapshot" of the practices for that time period only. Based on information provided by the practices, changes have occurred subsequent to 1982.

6.2 CLASSIFICATION OF ORGANIZATIONS

Most research studies which examine organizational characteristics and their influence on levels and patterns of utilization of health services have concentrated on two relatively gross comparisons: (1) fee-for service practice versus HMO; or (2) prepaid group practice versus IPA. However, it is evident that there is much variation in organizational structure among HMOs and among fee-for-service practices. Thus, while HMOs are all insuring organizations which also promise to deliver a specified set of health services in return for an insurance premium, the control that the insurer exerts over the services delivery organization and the structure of the delivery system can be very different across plans. Similarly, a fee-for-service practice may be organized as a for-profit firm with strong financial incentives which reward the physician who produces the most revenue, a non-profit organization with an academic orientation and salaried physicians, or in a variety of combinations of these alternatives.

In this study, the organizational and environmental characteristics of HMOs and fee-for-service group practices have been examined to identify the dimensions of structure which can more accurately classify plans into a typology which relates to the nature of their control over utilization of medical services. The major categories of classifying variables selected are:

- Decisionmaking structure
- Peer interaction and quality assurance mechanisms
- Utilization control methods
- Financial incentives

These measures go beyond the simplistic fee-for-service/HMO and PGP/IPA comparisons. For example, an IPA-HMO which capitates its member physicians, offers a hospital bonus, has highly structured QA procedures, requires prior authorization for hospital admission, and has a management team which controls the HMO and the IPA may have much greater utilization control than a PGP-HMO which pays member physicians on salary, requires only retrospective hospitalization review, and has an HMO management with little or no involvement in services delivery. Past studies which aggregated all PGPs for comparison with all IPAs found that, on average, IPAs experienced higher utilization than did PGPs. This finding, however, was a reflection of the fact that IPAs often have reimbursed member physicians on a fee-for-service basis, have had weak utilization control mechanisms, and management of the HMO has had little influence over the IPA. The typology of practices presented here focuses on combinations of characteristics which are thought to be influential in determining levels and use of services--in addition to the common designation of type of practice which has been used in earlier studies.

In this section, the reasoning and "quantification" of each of the categories of interest are discussed. Then, a description of the application of these measures to classify plans into a typology based on expected utilization patterns is presented. For some of the categories it was necessary to incorporate subjective impressions of the organization and how it operates into the scoring, as not all practices fell neatly into the classifying scheme.

Decisionmaking

Control over utilization should be facilitated by a strong management structure with overall decisionmaking concentrated in a single individual or in a small group of managers. However, the effect of the centralization of decisionmaking within the medical practice is affected by the organization's goals as well. For example, if the medical group is a for-profit organization and profits are enhanced by constraining use (e.g., if the group is capitated) for a substantial proportion of the

group's patients, then centralized decisionmaking may be associated with lower use. On the other hand, if the practice's profits are related to productivity (e.g., fee-for-service), then there are incentives to encourage patients to use, at least, the maximum services consistent with quality standards.

The ability of the insurer and medical group management to influence use patterns in the desired direction is expected to be related to the degree of control concentrated in one or a very small group of decisionmakers within these organizations. Our classification of organizations by the degree of centralization of decisionmaking takes into account, to some extent, both the management of the insurer and the medical group in the HMO organizations. Unfortunately, we do not have consistent data on the proportion of the medical group's total practice accounted for by prepaid patients; if we had this information, a more fully developed classification scheme could be envisioned. The categories of centralization of decisionmaking used to classify plans for this study and the scoring levels are:

- Highly centralized decisionmaking = 2
HMOs and/or medical groups with highly centralized management, concentrated in one or two individuals; or if the HMO management also controls the medical group and is centralized.
- Centralized decisionmaking = 1
Decisionmaking concentrated in a small group of managers with clearly defined functional roles.
- Decisionmaking = 0
Diffuse management, no strong leader or small management group with clear authority areas; management by consensus of a relatively large number of individuals.

Peer Interaction/Quality Assurance

The extent to which physicians formally, and informally, interact as a group, conduct and participate in educational and quality assurance activities is expected to influence practice patterns. The effect of peer interaction and quality assurance activities on use patterns, however, is ambiguous. In practices where physicians face financial incentives to prescribe more services for patients, peer interaction and quality assurance mechanisms will control the tendency of some physicians

to prescribe excessive quantities of services. In general, it seems reasonable to expect that the variation in use of services per diagnosis may be less in medical groups with high peer interaction and/or quality assurance activity.

Classification of the peer interaction and quality assurance activities within a medical group requires several components to be examined:

- Strong peer interaction = 2

Medical groups which participate in medical school/residency teaching programs, and/or conduct continuing medical education activities within the group, and/or are extremely stable in terms of membership of the group over a long time period and hold regular group specialty department meetings. In addition, because of co-location of the physicians clinically, informal peer interaction is an important factor in the practice.

- Moderate peer interaction = 1

Informal peer interaction associated with co-location, and group well-established and stable. However, no formal teaching or CME activities; few or no formal meetings of medical staff.

- Peer interaction = 0

Little or no peer interaction due to physicians not being co-located.

- Strong QA = 1

HMO and medical group QA requirements and/or highly structured QA system carried out on a regular basis with follow-through and clear procedures for corrective action.

- QA = 0

No formal mechanisms or formal mechanisms in place but not implemented on a regular basis.

The maximum score that a medical group can receive for this classification variable is 3 indicating that it exhibits substantial peer interaction and has a formal and effectively conducted QA mechanism in place.

Utilization Controls

The extent to which HMOs are able to directly influence utilization patterns is expected to be substantially related to the nature and effectiveness of its utilization review process. While UR is related to quality assurance in many respects, the intent of UR is specifically to assure that unnecessary utilization does not occur and/or that incentives that may influence member physicians to over or under utilize for their patients do not result in poor practice. There are a number of common UR mechanisms used and combinations of these are developed to classify practices by the extent of UR:

- Strong UR = 2
Hospital prior admission authorization and concurrent review of hospital episodes and either physician gatekeeper/case manager or physician utilization profiles.
- UR = 1
Hospital prior admission authorization or hospital concurrent review and either physician gatekeeper/case manager or physician profiles.
- UR = 0
Hospital retrospective review or primary care gatekeeper or physician profiles only.

The emphasis of the UR ranking is clearly on hospital control since that is expected to be the most costly services area and, in fact, previous studies have indicated that hospital use has been the major area of control for HMOs. Fee-for-service medical groups are expected to receive a zero score for this variable since UR is either not a consideration at all or is considered within the formal quality assurance process.

Financial Incentives

Two types of incentives influence utilization. First, some incentives are based on each physician's own behavior. That is, the physician receives an incentive payment if utilization is lower among his own patients and the level of that incentive is based on his own behavior. Or, indeed, under fee-for-service, a physician's income is higher when his own patients' utilization is higher. Second, other incentives are based on the behavior of the entire group. For example, if average utilization based on all the physician's patients is kept to some level, each physician receives a bonus. In this case, the bonus may be the same for all members of the group. This incentive scheme may be shown in a table as follows.

Individual Physician Incentives

		Constrain Utilization (+)	Neutral (0)	Increase Utilization (-)
Physician Group Incentives	Constrain Utilization (+)	2	1	0
	Increase Utilization (-)	0	-1	-2

- Strong Financial Incentives = 2

Both the medical group and individual physician receive all or some of their income on a basis which results in higher income if utilization is constrained; this may be direct capitation, substantial holdbacks, substantial hospital bonuses.

- Financial Incentives = 1

The medical group receives income tied to use constraint, but the individual physician is salaried.

- Financial Incentives = 0

The medical group or plan has incentives to decrease utilization while the individual physician has incentives to increase use, or, the group has incentives to increase use while the physician's incentives are to decrease use. (The latter combination is not expected to appear very often.)

- Financial Incentives = -1

The medical group or plan has incentives to increase use but physicians do not have similar individual incentives.

- Financial Incentives = -2

Both the group and the individual physicians have incentives to increase use.

Most fee-for-service medical groups will be classified as -2 under this scheme, although it is conceivable some (e.g. salaried physicians without productivity bonuses) might be scored -1.

6.3 FINDINGS

The results of the case study examination of the physicians' practices studied are presented in summary form in Tables 6.1 through 6.4. Examination of Table 6.1 reveals that there is a diverse group of organizations in the study. Of the HMOs, two are traditional IPAs, three are network IPAs, three are group model PGPs, and two are staff model PGPs. All the fee-for-service practices are for-profit; only two of the HMOs are for-profit. The size of the organization ranges from 90,000 patients/enrollees down to 10,000; and from 700 affiliated physicians



down to 9.5 FTEs. All but 1 of the HMOs are Federally qualified. The FFS practices were organized as much as 35 or more years ago and as recently as 1980. The HMOs' operational dates range from 1972 to 1981, with most developed in the mid-to-late 1970s.

Table 6.2 contains a detailed description of the characteristics of each organization. This description goes substantially beyond the simpler classification scheme which we have discussed above and permits the reader to quickly construct an overview of the organization and its structure.

Table 6.3 presents the classification of the 14 plans in this study by the five major characteristics of interest: (1) decisionmaking; (2) peer interaction/QA; (3) utilization review; and (4) financial incentives.

6.4 CLASSIFICATION OF PRACTICES

ATLANTIC PGP

1. Decisionmaking = 1
HMO management is relatively centralized, but decisionmaking on services delivery is completely relegated to the Independent Medical Group.
2. Peer Interaction/QA = 2
Stable practice where physicians are co-located, and peer interaction is substantial; however, QA is informal and only loosely conducted.
3. Utilization Review = 1
Primary gatekeeper and concurrent hospital length of stay review.
4. Financial Incentives = 1
Capitation to medical group for all ambulatory services; but individual MDs are salaried. Hospital bonus available, but targets never achieved.

Atlantic IPA

1. Decisionmaking = 2
HMO centralized and dominates IPA.
2. Peer Interaction/QA = 0
Traditional IPA with predominantly solo and small groups; QA is very weak for hospital services, nonexistent for ambulatory care.

3. Utilization Review = 2
Prior authorization, approved days of care, concurrent review for hospital services. Also primary care gatekeeper.
4. Financial Incentives = 2
Individual and IPA is capitated; IPA holds back 15-20 percent of capitation subject to overall use experience. No hospital bonus.

West PGP

1. Decisionmaking = 1
Medical group and HMO management are separated, but there appears to be much interaction and cooperation.
2. Peer Interaction/QA = 2
Quality Assurance mechanisms appear strong; evidence of positive professional interaction outside the QA is primarily associated with practice age/stability and clinical co-location of physicians.
3. Utilization Review = 2
Prior admission, concurrent review of hospital care; nurse reviewers of ambulatory care use; case manager approach.
4. Financial Incentives = 0
Medical group capitated; individual MDs receive income based on productivity if the revenues from increased productivity exceed the costs.

West IPA

1. Decisionmaking = 1
Separate boards for the HMO and the IPA, but a single individual serves as the executive officer for both organizations.
2. Peer Interaction/QA = 0
Traditional IPA with approximately 700 physician providers in solo and small group practice; QA is weak and run by the IPA.
3. Utilization Review = 1
Primary care gatekeeper; IPA board reviews MDs who have high and low use patterns; concurrent review of hospital stays.
4. Financial Incentives = 0
IPA is capitated with a 10 percent withhold pending the meeting of hospital utilization targets; individual MDs are paid on fee-for-service basis, but because of financial difficulties in 1982 reimbursement was set at 80 percent of charges.

West FFS

1. Decisionmaking = 0
Decentralized among medical group members and practice administrator.
2. Peer Interaction/QA = 3
Peer interaction is substantial; QA is highly structured and wide ranging. Physicians are co-located.
3. Utilization Review = 0
4. Financial Incentives = -2
Physician compensation is 95 percent based on productivity, the 5 percent is from equal shares.

Central PGP

1. Decisionmaking = 0
HMO management is diffuse and medical group is separately managed.
2. Peer Interaction/QA = 3
Medical group is well integrated and has been in existence for many years. Physician departments hold special activities involving interaction and consultation. QA is conducted by internal medical group review board; accredited by AAAHD and follows those QA standards
3. Utilization Review = 1
HMO Medical Director is responsible for hospital admission and referrals review; the medical group is responsible for concurrent review.
4. Financial Incentives = 0
Medical group receives capitation and hospital bonus; individual physicians receive income on a productivity basis.

Central IPA

1. Decisionmaking = 1
Management is highly structured and centralized in a few key positions.
2. Peer Interaction/QA = 1
QA is highly structured and there are HMO Medical Directors for each geographic area; a monthly meeting of the HMO Medical Director and representatives of each MD group conducts QA. Peer interaction may be present within the medical groups, but does not appear to be a factor among groups.

3. Utilization Review = 1
No formal hospital UR; regular MD profiles of use patterns; primary care gatekeeper with full responsibility for use authorization.
4. Financial Incentives = 2
Medical group is capitated for all ambulatory and hospital services provided by the group. If hospital use is too high, medical groups forfeit 5 percent of capitation. If hospital use is less than projected, medical group receives a hospital bonus. No information is available on how income is distributed within groups.

Central FFS

1. Decisionmaking = 1
Small, close-knit group of managers.
2. Peer Interaction/QA = 1
Physicians have worked together many years in a stable environment; however, no formal teaching or CME activities, and formal QA is nonexistent.
3. Utilization Review = 0
4. Financial Incentives = 2
Physician compensation based primarily on productivity, but no credit given for ancillary services. 20 percent of compensation is based on equal shares to all group members.

Pacific PGP

1. Decisionmaking = 2
HMO has strong central management and medical group is dominated by the HMO.
2. Peer Interaction/QA = 3
Physicians are staff of the HMO and a strong Medical Director for the HMO has considerable influence within the medical staff; CME is encouraged and conducted in-house; QA is formal and involves members of all departments. Physicians are co-located at two clinical offices.
3. Utilization Review = 0
Primary care gatekeeper with little authority; hospital retrospective review only.
4. Financial Incentives = 1
MDs are salaried; hospital incentive and ER/referral services pool provide between 10 and 20 percent of MD compensation.

Pacific IPA

1. Decisionmaking = 1
Decisionmaking is centralized in the Board and Executive Director, with some interaction with the parent corporation.
2. Peer Interaction/QA = 1
Peer interaction within the HMO is weak since this is a network IPA, although it may exist within the member medical groups; QA is highly structured and involves both internal medical group QA and HMO QA, which requires medical group member participation.
3. Utilization Review = 1
Case Manager and medical group Medical Director jointly authorize hospital admissions; systematic monitoring of use patterns.
4. Financial Incentives = 1
Medical groups are capitated for ambulatory and ancillary services; no withhold or other risk-sharing; no information on how groups distribute income to member MDs; hospital bonus pool is distributed among medical groups on the basis of each group's performance.

Pacific FFS

1. Decisionmaking = 2
Decisionmaking appears to be decentralized, but is actually concentrated in the president of the FFS.
2. Peer Interaction/QA = 3
Substantial peer interaction around educational and CME activities; QA is highly structured and has several dimensions. Practice has been in existence for over 30 years, and is stable.
3. Utilization Review = 0
4. Financial Incentives = -2
Physicians receive income distributed primarily on a productivity basis.

Midwest PGP

1. Decisionmaking = 1
HMO decisionmaking is concentrated in a small group of individuals with well-defined functional roles; since this is a staff model HMO, all decisionmaking is through the HMO management in consultation with the Medical Director.
2. Peer Interaction/QA = 2
Peer interaction is high due to the participation of the group in hospital-based teaching activities; however, there is high turnover among the staff physicians, (consequently the somewhat lower ranking); QA is highly structured and has several components.

3. Utilization Review = 1
Primary care gatekeeper, but weakly enforced; hospital concurrent review.
4. Financial Incentives = 0
MDs are salaried; HMO is nonprofit; bonuses based on productivity and quality. The ranking is complex for this practice as the group incentive is not profit, but fiscal soundness.

Midwest IPA

1. Decisionmaking = 1
Consensus approach to decisionmaking; HMO management services are purchased from another organization; HMO and IPA management functions are combined.
2. Peer Interaction/QA = 1
Interaction among medical groups serving the HMO appears weak to nonexistent; QA is carried out within medical groups and reviewed on a continuing basis by the HMO.
3. Utilization Review = 1
Prior admission for hospitalization required of medical groups with poor records; hospitals notify HMO when an HMO enrollee is admitted; concurrent review of hospital episodes; QA is focused on detection of underutilization patterns.
4. Financial Incentives = 1
Medical group is capitated for all ambulatory, ancillary, and inpatient physician services; hospital bonus; stop-loss for medical groups; no information on how medical groups distribute income or bonuses.

Midwest FFS

1. Decisionmaking = 0
No formal organizational structure was identified; decisionmaking is a joint product of the practice administrator, president of the group and heads of the four standing committees.
2. Peer Interaction/QA = 3
Peer interaction is high; the group has teaching responsibilities for a nearby hospital. QA is conducted by a Professional Affairs committee on a monthly basis; in addition, inpatient care is subjected to substantial QA review. Physicians are co-located.
3. Utilization Review = 0
4. Financial Incentives = -2
Productivity-based income distribution.

TABLE 6.1: CHARACTERISTICS OF ORGANIZATIONS STUDIES

Practice/Plan	Year Began Operation	No. of Patients/Enrollees	No. of Physicians*	For-Profit	Model Type	Federally Qualified	No. of Clinical Offices ^{1/}
Atlantic IPA	1981	12,000	370	No	IPA	Yes	--
Atlantic PGP	1978	10,000	9.5 FTE	No	Group	Yes	1
Midwest FFS	1980	35,000	37 FTE	Yes	--	--	1**
Midwest IPA	1977	90,000	37 Groups	No	Network	Yes	--
Midwest PGP	1972	53,000	55 FTE	No	Staff	Yes	5
Central FFS	1962	Unknown	17 FTE	Yes	--	--	2
Central IPA	1975	32,500	150	Yes	Network	Yes	--
Central PGP	1978	18,000	60	No	Group	No	2
Pacific FFS	Pre-1950	110-120,000	140	Yes	--	--	2
Pacific IPA	1978	60,000	600/11 Groups	No	Network	Yes	--
Pacific PGP	1974	20,000	20	No	Staff	Yes	2
West FFS	Pre-1960	35,000	33 FTE	Yes	--	--	2
West IPA	1974	30,000	700	No	IPA	Yes	--
West PGP	1980	30,000	38 FTE	Yes	Group	Yes	2

*Absolute number of providers or, if known, the number of full-time-equivalent (FTE) providers.

**Do contract work at other sites.

^{1/}Question applicable to FFS and PGP practices only.

TABLE 6.2: ORGANIZATIONAL CHARACTERISTICS

PRACTICE ARRANGEMENT	ORGANIZATIONAL FACTORS								UTILIZATION REVIEW		QUALITY ASSURANCE					MEDICAL GROUP INCENTIVES		PHYSICIAN INCENTIVES						
	Centralized Decisionmaking	Separation of HMO & Medical Group Manage- ment	Separate HMO & Medical Group Medical Directors	For-Profit HMO	Practice Admin- istrator's Income Affected by Profit	Organized by a Physician Group	Organized by an Insurer Group	Organized by a Hospital	Organized by a Consumer Group	Primary Care Gatekeeper	Hospital Preadmission Review	Hospital Concurrent Review	HMO QA Review Only	Other External QA Review	Medical Group & HMO QA Review	Medical Group QA Review Only	Strong Peer Interaction	Capitation to Group	Group Hospital Bonus	Group Withhold/ Risk-Sharing	Physician Capitation	Physician Payment Withhold	Ancillary Services Excluded from Income Calculations	Physician Hospital Bonus
Pacific FFS						x								x	x	x	x						x	
West FFS					x	x										x	x							
Midwest FFS								x						x	x	x	x						x	
Central FFS	x					x											x						x	
Pacific PGP	x							x		x			x				x						x	
West PGP	x	x	x	x	x	x				x	x	x			x		x	x					x	
Midwest PGP	x							x		x		x	x				x							
Central PGP		x									x	x		x			x	x					x	
Atlantic PGP	x	x				x			x	x	x	x		x		x								
Pacific IPA	x	x	x							x					x									
West IPA	x					x				x		x	x										x	
Midwest IPA	x	x	x								x	x			x									
Central IPA	x	x	x	x	x				x	x					x									
Atlantic IPA	x				x	x			x	x	x	x			x									

An x indicates that the characteristic is present in the practice. Each characteristic has been defined to represent control over utilization of services. A blank indicates that the characteristic is either not present or that it was not feasible to obtain the information (e.g., individual physician financial incentives in an IPA).

TABLE 6.3

CLASSIFICATION OF PRACTICES BY ORGANIZATIONAL CHARACTERISTICS OF PRACTICE
SITES EXPECTED TO AFFECT USE PATTERNS

PRACTICE SITE	DECISION MAKING (DM)	PEER INTERACTION/ QUALITY ASSURANCE (PI/QA)	UTILIZATION REVIEW (UR)	FINANCIAL INCENTIVES (FI)
PACIFIC PGP	2	3	0	1
PACIFIC IPA	1	1	1	1
PACIFIC FFS	2	3	0	-2
WEST PGP	1	2	2	0
WEST IPA	1	0	1	0
WEST FFS+	0	3	0	-2
MIDWEST PGP	1	2	1	0
MIDWEST IPA	1	1	1	1
MIDWEST FFS	0	3	0	-2
CENTRAL PGP	0	3	1	0
CENTRAL IPA	1	1	1	2
CENTRAL FFS	1	1	0	-2
ATLANTIC PGP+	1	2	1	1
ATLANTIC IPA	2	0	2	2

CHAPTER 7

RESULTS: DIAGNOSIS SPECIFIC ANALYSES OF UTILIZATION

In this chapter, an analysis is presented of utilization of services for six diagnoses, cholecystitis, duodenal ulcer, otitis media, pediatric asthma, uterine bleeding, and pregnancy. The discussion of each diagnosis begins with comparisons of various measures of utilization across individual practice sites and substitution of alternate types of care, e.g., medication versus surgery, within practice sites. Next, the data are arranged by practice type (IPA, FFS, or PGP), geographic region, and organizational characteristics (decisionmaking, peer interaction/quality assurance, utilization review, and financial incentives). Significant differences in utilization within these categories are highlighted. Following the descriptive analysis, patient age, sex (where appropriate), and geographic region are held constant to see if significant utilization differences remain.

Comparison of findings across all six diagnoses is presented in Chapter 8.

A. CHOLECYSTITIS

Descriptive Analysis

Mean utilization data by practice site for cholecystitis is shown in Table A.1, with comparable data in standardized units shown in Table A.2. Only ten sites had data for 10 or more patients in the T1 time period, and are therefore the only sites for which data are shown.

All of the variables tested show significant differences across sites at the 0.05 level.¹ Office visits range from a low of 1.60 visits to a high of 3.27 visits per patient. Hospital admissions range from 0.45 to 1.00. In sites with higher values for hospital admissions, some patients may have been admitted for diagnostic procedures, although the data collected does not provide a link between hospital admissions and diagnostic procedures. In all but one site there are some patients with diagnostic procedures who were not admitted to the hospital, and in some sites there were patients with a hospital admission who were apparently admitted for observation only, as the patient had neither surgery nor a diagnostic procedure. (See Table A.1.b) A few patients had two admissions, one apparently for diagnosis, and a later admission for surgery. Thus, in the site with a mean for admissions of 1.00, not all patients were admitted to the hospital.

Six of the ten sites never admitted patients without having surgery. All tests at these sites not associated with surgery, were done on an outpatient basis. Only one site - Pacific FFS - performed no tests without an admission, and this site had only one patient with a diagnostic test that was not associated with surgery.

Over 40 percent of the patients at Pacific FFS and Midwest PGP received surgery but had no diagnostic test recorded. While most other sites also had patients with surgery but no diagnostic tests, the percent of patients was much smaller. The high percentage of patients with this status at Pacific FFS and Midwest PGP may be because these sites serve as referral centers, with patients being referred for surgery after a clear diagnosis has been made elsewhere. One explanation for the phenomenon of surgery but no tests is that the ambulatory medical record did not include data on inpatient diagnostic procedures.

While it is likely that an FFS group would serve as a referral center, it is unlikely that a PGP would. There are probably other organizational

1. This is based on an ANOVA test. It means that one can reject the hypothesis that all the sites are the same. It does not necessarily mean that every possible pairing of sites will produce significantly different results.

characteristics of Midwest PGP which cause this behavior. However, the characteristics of the group suggest that there would be higher rather than lower utilization of diagnostic tests. The group is based in a teaching hospital, and provides residency training in most specialties. Additionally, the group has made an explicit decision not to hire family or general practitioners, and instead uses internists, pediatricians, and obstetrician-gynecologists as primary care physicians.

While not all patients admitted to the hospital with a diagnosis of cholecystitis receive surgery, hospital admissions and surgeries are highly correlated, with a correlation coefficient of 0.76 across all sites. This value is statistically significant at the 0.001 confidence level.

In calculating total utilization through the use of standardized units, all patients admitted to the hospital are given a value of 259.73 regardless of why they were admitted. If they receive surgery an additional 64.89 is added to their score. Thus, patients who are admitted only for a diagnostic procedure may have a standardized score which overestimates their actual utilization. This problem of using a constant value for all hospitalizations is greatest at West FFS where 30 percent of the patients were either admitted for a diagnostic test, or were admitted to the hospital and had neither a test nor surgery. This is true for 24 percent of the patients at West IPA, while none of the patients at Pacific IPA were admitted without having surgery.

Diagnostic Procedures/Lab Tests/X-rays

At three practice sites, Pacific IPA, Midwest PGP, and Midwest IPA, all patients who had cholecystography also had a G.I. Series. At all other sites, patients generally had only one of these two procedures, or a fiberoptic exam. Physicians usually order a G.I. series for cholecystitis when they are unsure of the diagnosis and believe a patient may have an ulcer or some other problem.

Standard clinical practice requires any patient who has the surgical procedure cholecystectomy, to also have the diagnostic procedure cholecystography. Our data do not support this, but the anomalous results may reflect the data collection process, rather than unusual clinical

performance. The cholecystography may have been performed in an earlier time period and therefore was not captured in this data set, or the patient may have had the diagnostic procedure at another practice site and was referred to a physician in our sample, already having a clear diagnosis for surgery. Among sites where the percent of patients having cholecystography is lower than those with the surgical procedure, the mean values for lab tests and lab profiles are relatively high except for one site - Central FFS - where the value for fiberoptic exams is high, with a value of 0.24. These figures may suggest a substitution of lab tests for cholecystograms. Only three other sites had any patients with fiberoptic exams, with the highest mean value among them being 0.07 at Pacific IPA.

When the practice sites are grouped according to type, region, and organizational characteristics (Tables A.3 & A.4), some of the previously significant differences disappear.

Differences in utilization by type of practice are significant only for lab profiles and prescribed medications, with the latter significant at the 0.10 level. The geographic region of a site is more important in determining utilization. Office visits, lab tests, lab profiles, X-rays, G.I. series, and the surgical procedure - cholecystectomy - are all significant. Office visits range from a low mean value of 1.80 in the Midwest to a high of 3.05 in the Pacific region. Except for G.I. series, the Pacific region has the highest mean value for all of the significant variables among the four geographic regions (the Atlantic region had no sites with 10 or more cholecystitis cases).

The degree of centralization of decisionmaking is significant for office visits, hospital admissions, lab profiles, x-rays, and cholecystectomies. However, only Pacific FFS has highly centralized decisionmaking (DM=2). This site has relatively high mean values for most of the utilization variables tested. It will be recalled that the Pacific FFS site also serves as a major referral center, so that its case-mix may be biased in favor of patients awaiting surgery. When that site is dropped, only lab profiles, x-rays, and standardized unit scores for office visits and total ambulatory care remain significant. This results in a higher degree of centralization being associated with a higher degree of

utilization. However, the impact that centralization of decisionmaking has will depend on the goals of the organization. Thus, it is difficult to examine the organizational characteristics such as decisionmaking, utilization review or financial incentives, separately.

The amount of peer interaction and quality assurance is significant for medications, hospital admissions, lab tests, lab profiles, X-rays, and fiberoptic exams. For both $PI/QA=0$ and $PI/QA=2$, only one site's values are used; thus it is difficult to draw any conclusions from the values presented here because of the impossibility of separating out the organizational type from other factors which might determine the level of utilization.

The types of financial incentives offered by the practice group are significant for office visits, medications, lab tests, lab profiles, X-rays, G.I. series, and fiberoptic exams.

Regression Results

In the first stage of the regression analysis expected utilization is calculated by regressing SUAC, SUOV, TSU, SUADM on patient sex and region. The results of these regressions are in Table A.5.

Patient sex was significant only for ambulatory care, while geographic region was significant for ambulatory care, office visits, and marginally significant for total utilization. In all cases utilization in the Pacific region was higher than in any other region.

The resulting expected utilization values for each site for each of the dependent variables was then tested against practice type and the other organizational characteristics. These results are shown in Table A.6.

Practice type is significant after controlling for patients sex and the geographic region of the practice site for ambulatory care. While total ambulatory care standardized units are significant by practice type in the ANOVA test, the mean values range from a low of 7.34 for PGPs, a middle value of 8.07 for IPAs, and a high of 11.09 for FFS groups (Table A.4). After controlling for region, PGPs (the omitted dummy variable), have the highest mean utilization, FFSs are in the middle range, and IPAs have the lowest mean values (Table A.6).

Total Ambulatory Care Standardized Units

Initial Ranking		Ranking After Controlling for Sex and Region
Low	PGP	IPA
Middle	IPA	FFS
High	FFS	PGP

Particularly strong regional effects show up for cholecystitis because there are only two practice sites with a PGP practice type. In the Pacific region, both the IPA and FFS have particularly high mean values for ambulatory care. While the unadjusted mean value for PGPs is lower than for the other two practice types, there is no PGP in the Pacific region to mediate the effect of the high values for the IPA and FFS. In fact, if only the two regions which have all three practice sites are examined, PGPs have the highest mean utilization (7.29), FFSs are in the middle (6.18), and IPAs have the lowest mean utilization (5.23). This is the same ranking that results after the regression equations. Thus, the regression results probably give a better picture of differences in utilization because the missing sites are controlled for, as well as the variation caused by regional practice styles.

Controlling for expected utilization results in many of the previously significant differences in utilization among organizational characteristics shown on Table A.4 either diminishing or disappearing completely. For instance, the degree of centralization of decisionmaking for ambulatory care initially was highly significant, with large differences in the mean values. However, when sex and geographic region are controlled for, no significant differences among decisionmaking categories remain.

TABLE A.1 CHOLECYSTITIS -- MEAN UTILIZATION BY PRACTICE SITE

PRACTICE SITE	# OF PATIENTS	OFFICE VISITS	MEDICATIONS	HOSP. ADMITS	LAB TESTS	LAB PROFILES	X-RAYS	G I SERIES	FIBEROP-TIC EXAM	CHOLECYS-TECTOMY	CHOLECYS-TOGRAPHY
CIFIC PGP	--	---	---	---	---	---	---	---	---	---	---
CIFIC IPA	15	3.27**	1.27**	0.60**	1.67**	1.07**	1.13**	0.47**	0.07**	0.53**	0.47**
CIFIC FFS	27	2.93	0.70	0.85	0.74	1.41	1.19	0.15	0.00	0.78	0.26
ST PGP+	--	---	---	---	---	---	---	---	---	---	---
ST IPA	21	2.71	(a)	1.00	0.95	0.24	0.05	0.33	0.00	0.57	0.57
ST FFS	10	2.10	0.90	0.50	0.30	0.20	0.50	0.40	0.00	0.20	0.20
WEST PGP	28	1.89	0.36	0.71	1.68	0.36	0.61	0.14	0.00	0.54	0.14
WEST IPA	17	1.88	0.76	0.53	0.18	0.24	0.41	0.35	0.06	0.41	0.35
WEST FFS	20	1.60	1.05	0.55	0.50	0.75	0.35	0.10	0.00	0.40	0.55
NTRAL PGP	21	2.43	0.71	0.67	0.29	0.14	0.57	0.19	0.05	0.62	0.52
NTRAL IPA	20	2.05	0.70	0.45	0.15	0.00	0.35	0.05	0.00	0.25	0.20
NTRAL FFS	21	2.52	1.43	0.76	0.10	0.48	0.67	0.19	0.24	0.62	0.38
LANTIC PGP+	--	---	---	---	---	---	---	---	---	---	---
LANTIC IPA+	--	---	---	---	---	---	---	---	---	---	---

TOTAL: 200

Differences among the sites are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all sites.

Differences among the sites are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all sites.

Under ten patient records were obtained for T1 at this site.

Prescribed medications data are low for West IPA because of coding errors and lack of medications data on claims form.

TABLE A.1.b PERCENT DISTRIBUTION OF CHOLECYSTITIS PATIENTS WITH HOSPITAL ADMISSION,
DIAGNOSTIC PROCEDURES, AND SURGERY

PRACTICE	W/ADMIT NO SURGERY NO DIAG PROCEDURE	W/ADMIT W/SURGERY NO DIAG PROCEDURE	W/ADMIT W/SURGERY ONE DIAG PROCEDURE	W/ADMIT W/SURGERY TWO OR MORE DIAG PROCEDURE	W/ADMIT W/OUT SURGERY W/1 OR MORE DIAG PROCEDURE	W/OUT ADMIT W/1 OR MORE DIAG PROCEDURE	WITH MULTIPLE ADMISSIONS
CLINIC IPA	0	0	40%	13%	0	13%	7%
CLINIC FFS	4%	44%	30	4	4%	0	0
IPA	10	14	29	14	14	10	19
FFS	20	0	20	0	10	10	0
WEST PGP	11	43	11	0	0	14	7
WEST IPA	6	24	6	12	0	29	0
WEST FFS	0	5	35	0	15	10	0
RAL PGP	0	24	33	5	0	24	5
RAL IPA	20	20	5	0	0	15	0
RAL FFS	5	14	29	19	0	14	10

TABLE A.2 CHOLECYSTITIS -- MEAN STANDARDIZED UTILIZATION BY PRACTICE SITE

PRACTICE SITE	NUMBER OF PATIENTS	OFFICE VISITS	MEDI-CATIONS	AMBULATORY CARE-TOTAL (c)	SPECIAL PROCEDURES	HOSPITAL ADMISSIONS	TOTAL W/MEDS (d)	TOTAL W/OUT MEDS (e)
CIFIC PGP'+	--	---	---	---	---	---	---	---
CIFIC IPA	15	3.75**	2.58**	19.16**	40.22**	155.84**	217.80**	215.23**
CIFIC FFS	27	3.86	1.44	20.18	52.16	221.25	295.03	293.59
ST PGP+	--	---	---	---	---	---	---	--
ST IPA	21	3.66	(b)	5.21	40.85	259.73	(b)	305.79
ST FFS	10	3.39	1.84	6.61	15.80	129.87	154.11	152.28
DWEST PGP	28	2.04	0.73	7.67	36.02	185.52	229.93	229.21
DWEST IPA	17	2.01	1.56	5.54	31.16	137.51	175.76	174.20
DWEST FFS	20	2.37	2.14	5.17	28.41	142.85	178.57	176.43
NTRAL PGP	21	3.35	1.46	6.90	44.09	173.16	225.61	224.15
NTRAL IPA	20	2.36	1.43	4.91	17.19	116.88	140.41	138.98
NTRAL FFS	21	2.74	2.91	7.19	47.90	197.89	255.90	252.98
LANTIC PGP+	--	---	---	---	---	---	---	---
LANTIC IPA+	--	---	---	---	---	---	---	---

TOTAL: 200

Differences among the sites are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all sites.

Differences among the sites are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all sites.

Under ten patient records were obtained for T1 at this site.

Standardized unit values are missing because of missing raw data. See Table 1 for details.

Ambulatory care standardized units (SU) = (office visits SU + lab profile SU + lab test SU + X-rays SU + other procedures SU)

Total standardized units (SU) = (ambulatory care SU + prescribed medications SU + special procedures SU + hospital admissions SU)

Total standardized units without medications = (ambulatory care SU + special procedures SU + hospital admissions SU)

TABLE A.3 CHOLECYSTITIS -- UTILIZATION BY PRACTICE TYPE, REGION,
AND ORGANIZATIONAL CHARACTERISTICS

PRACTICE TYPE	# OF PATIENTS	OFFICE VISITS	MEDICATIONS	HOSP. ADMITS	LAB TESTS	LAB PROFILES	X-RAYS	GI SERIES	FIBEROP-TIC EXAM	CHOLECYS-TECTOMY	CHOLECYS-TOGRAPHY

	49	2.12	0.51*	0.69	1.08	0.27**	0.59	0.16	0.02	0.57	0.31
	73(f)	2.45	0.88	0.66	0.70	0.34	0.44	0.29	0.03	0.44	0.40
	78	2.37	1.01	0.71	0.45	0.83	0.74	0.18	0.06	0.56	0.36
GRAPHIC REGION											

IFIC	42	3.05*	0.90	0.76	1.07**	1.29**	1.17**	0.26**	0.02	0.69*	0.33
T	31(f)	2.52	0.90	0.84	0.74	0.23	0.19	0.35	0.00	0.45	0.45
WEST	65	1.80	0.68	0.62	0.92	0.45	0.48	0.18	0.02	0.46	0.32
TRAL	62	2.33	0.95	0.63	0.18	0.21	0.53	0.15	0.10	0.50	0.37
ANTIC	--	---	---	---	---	---	---	---	---	---	---
ISIONMAKING (DM)											

0	51	2.04**	0.88	0.59*	0.37	0.39**	0.47**	0.20	0.02	0.45**	0.47
1	122(f)	2.33	0.85	0.69	0.82	0.37	0.52	0.24	0.06	0.49	0.34
2	27	2.93	0.70	0.85	0.74	1.41	1.19	0.14	0.00	0.77	0.26
R INTERACTION/QUALITY ASSURANCE (PI/QA)											

QA=0	21(f)	2.71	(f)**	1.00**	0.95**	0.24**	0.05**	0.33	0.00**	0.57	0.57
QA=1	73	2.40	1.04	0.59	0.45	0.41	0.62	0.25	0.10	0.45	0.34
QA=2	28	1.89	0.36	0.71	1.68	0.36	0.61	0.14	0.00	0.54	0.14
QA=3	78	2.35	0.82	0.68	0.50	0.74	0.72	0.18	0.01	0.56	0.40
LIZATION REVIEW (UR)											

0	78	2.37	1.01**	0.71	0.45*	0.83*	0.74*	0.18	0.06	0.56	0.36
1	122(f)	2.32	0.70	0.67	0.85	0.31	0.50	0.24	0.02	0.49	0.36
2	--	---	---	---	---	---	---	---	---	---	---
ANCIAL INCENTIVES (FI)											

-2	57	2.32*	0.86**	0.68	0.58**	0.96**	0.77**	0.18**	0.00**	0.54	0.35
0	70(f)	2.30	0.57	0.79	1.04	0.26	0.43	0.22	0.01	0.57	0.39
1	32	2.53	1.00	0.56	0.88	0.63	0.75	0.41	0.06	0.47	0.41
2	41	2.29	1.07	0.61	0.12	0.24	0.51	0.12	0.12	0.44	0.29

Differences among the categories are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all categories.

Differences among the categories are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all categories.

West IPA is missing medications data. Therefore, mean values for medications are calculated without this site. The N of patients for medications is lower than indicated for categories which include these sites.

TABLE A.4 CHOLECYSTITIS -- MEAN STANDARDIZED UNITS BY PRACTICE TYPE, REGION,
AND ORGANIZATIONAL CHARACTERISTICS

PRACTICE TYPE	NUMBER OF PATIENTS	OFFICE VISITS	MEDICATIONS	AMBULATORY CARE-TOTAL	SPECIAL PROCEDURES	HOSPITAL ADMISSIONS	TOTAL W/MEDS	TOTAL W/OUT MEDS
	49	2.60	1.04	7.34*	39.48	180.22	228.08	227.04
	73(f)	2.94	1.80	8.07	31.98	170.78	174.28	210.83
	78	3.11	2.07	11.09	40.26	183.15	236.57	234.50
GRAPHIC REGION								
IFIC	42	3.81**	1.85	19.81**	47.90	197.89	267.45	265.60
T	31(f)	3.58	1.84	5.66	32.77	217.84	154.12	256.27
WEST	65	2.14	1.38	6.34	32.41	159.84	199.96	198.58
TRAL	62	2.82	1.94	6.36	36.70	163.38	208.38	206.44
ANTIC	--	---	---	---	---	---	---	---
ISIONMAKING (DM)								
0	51	2.97**	1.80	6.17**	32.39**	152.78**	193.14**	191.39**
1	122(f)	2.70	1.74	7.83	35.65	178.83	206.69	222.31
2	27	3.85	1.44	20.18	52.16	221.25	295.03	293.57
R INTERACTION/QUALITY ASSURANCE (PI/QA)								
QA=0	21(f)	3.67**	(f)	5.21*	40.85	259.73**	(f)*	305.79*
QA=1	73	2.68	2.12	8.64	34.01	152.99	197.77	195.64
QA=2	28	2.04	0.73	7.67	36.02	185.52	229.94	229.21
QA=3	78	3.28	1.67	11.02	39.24	176.49	228.41	226.74
LIZATION REVIEW (UR)								
0	78	3.10	2.07	11.09**	40.26	183.15	236.57	234.50
1	122(f)	2.81	1.43	7.78	34.99	174.57	200.39	217.34
2	--	---	---	---	---	---	---	---
ANCIAL INCENTIVES (FI)								
-2	57	3.27	1.75	12.53**	37.45	177.71	229.45	227.69
0	87(f)	2.75	1.17	6.47	38.18	191.07	214.61	235.72
1	15	3.76	2.58	19.16	40.22	155.84	217.80	215.23
2	41	2.55	2.19	6.08	32.92	158.37	199.56	197.37

Differences among the categories are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all categories.

Differences among the categories are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all categories.

West IPA is missing medications data. Therefore, mean values for medications are calculated without this site. The N of patients in medications and Total Standardized Units with medications is lower than indicated for categories which include these sites.

TABLE A.5 UTILIZATION OF SERVICES FOR CHOLECYSTITIS PATIENTS
AS A FUNCTION OF PATIENT SEX AND PRACTICE GEOGRAPHIC REGION

INDEPENDENT VARIABLE	OFFICE VISITS (SUOV)	AMBULATORY CARE (SUAC)	HOSPITAL ADMISSIONS (SUADM)	TOTAL TOTAL STANDARD UNITS (TSU)
MALE	-0.1469 (0.3536)	-2.8414** (1.4085)	5.2188 (25.4526)	-1.8691 (30.2223)
PACIFIC	1.8655** (0.4245)	13.6153** (1.6908)	38.428 (30.5549)	67.3012* (36.2807)
WEST	1.5549** (0.4540)	-0.0240 (1.8084)	53.7257 (32.6805)	54.4596 (38.8046)
CENTRAL	0.7579** (0.3651)	0.0214 (1.4543)	2.8891 (26.2804)	6.9326 (31.2052)
INTERCEPT	2.0208** (0.3649)	6.0295** (1.4537)	174.475** (26.2699)	214.322** (31.1926)
ADJUSTED R^2	0.11	0.34	0.03	0.03
N	199	199	199	199

* Indicates statistical significance at the 0.10 confidence level.

** Indicates statistical significance at the 0.05 confidence level.

(Standard errors are shown in parentheses)

TABLE A.6 DIFFERENCE BETWEEN ACTUAL AND EXPECTED UTILIZATION
FOR CHOLECYSTITIS PATIENTS AS A FUNCTION OF PRACTICE TYPE AND
ORGANIZATIONAL CHARACTERISTICS

INDEPENDENT VARIABLES -----	OFFICE VISITS (SUOV)	AMBULATORY CARE (SUAC)	HOSPITAL ADMISSIONS (SUADM)	TOTAL UTILIZATION (WITHOUT MEDS) (TSU)
PRACTICE TYPE -----				
IPA	-0.1141 (0.0842)	-0.3062** (0.0891)	-0.2136 (0.1715)	-0.2263 (0.1747)
FFS	-0.0352 (0.0831)	-0.1224 (0.0879)	-0.1003 (0.1693)	-0.1084 (0.1724)
INTERCEPT	0.0558 (0.0651)	0.1612 (0.0689)**	0.1172 (0.1327)	0.1249 (0.1351)
ADJUSTED R^2	0.01	0.54	-0.05	-0.03
DECISION MAKING (DM) -----				
DM=0	0.1727** (0.0568)	0.0850 (0.1303)	-0.1175 (0.1606)	-0.1017 (0.1672)
DM=2	0.0623 (0.0724)	0.0527 (0.1662)	0.9949 (0.2049)	0.0918 (0.2139)
INTERCEPT	-0.0520 (0.0308)	-0.0271 (0.0708)	0.0166 (0.0872)	0.0136 (0.0911)
ADJUSTED R^2	0.45	-0.21	-0.13	-0.17
PEER INTERACTION/QUALITY ASSURANCE (PI/QA) -----				
PI/QA=0	-0.0611 (0.0939)	-0.1581 (0.1677)	0.2208 (0.2289)	0.2145 (0.2395)
PI/QA=1	-0.1566** (0.0623)	-0.1271 (0.1111)	-0.0654 (0.1516)	-0.0710 (0.1586)
PI/QA=2	-0.1326 (0.0842)	0.1286 (0.1503)	0.1898 (0.2051)	0.1755 (0.2146)
INTERCEPT	0.0826* (0.0433)	0.0467 (0.0772)	-0.0258 (0.1054)	-0.0212 (0.1103)
ADJUSTED R^2	0.30	0.08	-0.05	-0.09
UTILIZATION REVIEW (UR) -----				
UR=0	0.0331 (0.0695)	0.6608 (0.1073)	0.0275 (0.1392)	0.0270 (0.1428)
INTERCEPT	-0.0124 (0.0434)	-0.0220 (0.0670)	-0.0106 (0.0869)	-0.0105 (0.0892)
ADJUSTED R^2	-0.09	-0.08	-0.12	-0.12

TABLE 6 - CHOLECYSTITIS (cont.)

INDEPENDENT
VARIABLES

-----	(SUOV)	(SUAC)	(SUADM)	(TSU)
FINANCIAL INCENTIVES (FI)				
FI=0	-0.0050 (0.0794)	0.0679 (0.1384)	0.1960 (0.1608)	0.2059 (0.1672)
FI=1	-0.0816 (0.0983)	-0.1105 (0.1714)	-0.1161 (0.1992)	-0.0935 (0.2071)
FI=2	-0.1400 (0.0911)	-0.0773 (0.1589)	0.0270 (0.1846)	0.0167 (0.1920)
INTERCEPT	0.0405 (0.0589)	0.0115 (0.1027)	-0.0555 (0.1194)	0.0605 (0.1242)
ADJUSTED R2	-0.06	-0.19	-0.01	-0.14

PRACTICE TYPE AND DECISION MAKING

IPA	-0.0401 (0.0777)	-0.3380** (0.1113)	-0.3286 (0.1797)	-0.3354 (0.1905)
FFS	-0.0575 (0.0771)	-0.1036 (0.1105)	-0.1101 (0.1784)	-0.1148 (0.1892)
DM=0	0.1726* (0.0771)	-0.0742 (0.1105)	-0.2684 (0.1784)	-0.2547 (0.1892)
DM=2	0.0864 (0.1013)	-0.0638 (0.1452)	-0.0060 (0.2344)	-0.0139 (0.2485)
INTERCEPT	-0.0182 (0.0636)	0.1930* (0.0912)	0.2322 (0.1472)	0.2340 (0.1561)
ADJUSTED R2	0.41	0.31	0.06	-0.01

PRACTICE TYPE AND PEER INTERACTION/QUALITY ASSURANCE

IPA	-0.2137 (0.12215)	-0.4025 (0.2168)	-0.5375 (0.2745)	-0.5921* (0.2809)
FFS	-0.1564 (0.0858)	-0.1310 (0.1523)	-0.1102 (0.1929)	-0.1461 (0.1973)
PI/QA=0	0.03820 (0.1221)	0.14866 (0.2169)	0.6778* (0.2745)	0.6998* (0.2809)
PI/QA=1	-0.0737 (0.0858)	0.10155 (0.1523)	0.2686 (0.1929)	0.2860 (0.1973)
PI/QA=2	-0.2469* (0.0971)	0.0329 (0.1723)	0.1092 (0.2181)	0.0688 (0.2232)
INTERCEPT	0.1963* (0.0733)	0.1424 (0.1302)	0.0548 (0.1649)	0.0856 (0.1687)
ADJUSTED R2	0.46	0.30	0.31	0.31

TABLE 6 - CHOLECYSTITIS (cont.)

INDEPENDENT
VARIABLES
-----PRACTICE TYPE AND UTILIZATION REVIEW (a)

IPA

FFS

UR=0

INTERCEPT

ADJUSTED R2

PRACTICE TYPE AND FINANCIAL INCENTIVES

IPA	-0.0343 (0.0129)	-0.2726 (0.1394)	-0.0778 (0.1967)	-0.0684 (0.1881)
FFS	0.1016 (0.2016)	0.0940 (0.2176)	0.5731 (0.3070)	0.6206 (0.2935)
FI=0	0.1169 (0.1999)	0.2438 (0.2157)	0.7457 (0.3043)	0.8060 (0.2909)
FI=1	0.0543 (0.1896)	0.2561 (0.2046)	0.3791 (0.2886)	0.4586 (0.2759)
FI=2	-0.0736 (0.5264)	0.1016 (0.1364)	0.2685 (0.1925)	0.2860 (0.1840)
INTERCEPT	-0.0611 (0.2120)	-0.0825 (0.2289)	-0.1285 (0.3228)	-0.6812 (0.3086)
ADJUSTED R2	-0.17	0.44	0.31	0.40

* Indicates statistically significant results at the 0.10 confidence level.

** Indicates statistically significant results at the 0.05 confidence level.

(Standard errors are shown in parentheses)

(a) Because of missing cases for cholecystitis, all sites with UR=1
Therefore, a regression testing the effects of practice type and
review together are not valid.

Note: For all regressions the number of observations is 10.

B. DUODENAL ULCER

Descriptive Analysis

Wide variation was found in the treatment of duodenal ulcer across practice sites. Some sites appear to be low utilizers of services, on average, while other sites appear to be high utilizers. Moreover, these patterns are not consistent with practice type; PGP, IPA or FFS.

Data on more than 10 ulcer patients are available at only nine sites. In the Pacific region only one site had adequate data and no sites in the Atlantic region yielded adequate data to study. Except for lab tests, lab profiles, medications and G.I. series, differences across the sites for the utilization measures were statistically significant at a 0.05 level as shown on Tables B.1 and B.2.

The mean number of office visits during the three month period ranges from a low of 1.21 at Midwest FFS to a high of 2.92 at Pacific FFS. At the seven sites where medication data is available, on average each patient received 1.24 to 2.30 prescriptions. These data are of particular interest because of the widespread use of medicine for ulcers. No medications were prescribed for 28 percent of patients at Pacific FFS, 32 percent at West PGP, and 26 percent of patients at Midwest FFS; the other four sites had from 4 to 19 percent of their patients without medication. In contrast, at West FFS 40 percent of patients received 3 or more prescriptions during the three-month time period (Table B.1.b).

Hospital admission rates per patient varied widely among the nine sites from a mean of 0.04 at Central IPA to 0.64 at Pacific FFS (Table B.1). On average, hospital admissions rates were significantly higher for FFS than for IPA or PGP practice types (Table B.3). Two explanations for this wide variation are possible. First, the severity of illness may vary across sites, particularly if some sites serve as referral centers. Some practices may treat patients whose diagnoses already have been established so that further testing and hospitalization may be less necessary. For example, at Pacific FFS, 20 percent of patients are admitted with no tests. Almost half of the patients at this site have both tests and a hospital admission; this may indicate that these patients are getting a more intensive diagnostic

work-up than the 28 percent of patients at this site who were tested outside the hospital. At all sites there were some patients who were neither admitted nor tested with a G.I. series nor fiberoptic exam. Their disease might have been relatively minor, or, the episode studied might have been a recent flareup of a previously diagnosed problem, so only maintenance treatment was required. Second, practices may vary in their capacity to provide tests outside the hospital. At three sites, Midwest PGP, Central PGP and Central FFS, about half the patients receiving special procedures such as G.I. series or fiberoptic exams do so without a hospital admission (Table B.1.c). At two other sites, West PGP and West IPA, all G.I. series or fiberoptic exams are associated with an admission. While it may be the case that all these patients had severe ulcers requiring treatment in the hospital, it seems more likely that many of these admissions were mainly for the diagnostic procedure. Unfortunately, our data do not include length of stay to help distinguish the reasons for hospitalization.

When raw utilization data are converted into standardized units, hospital admissions are assigned 386.68 SUs, fiberoptic exams 22.64 SUs, and G.I. Series 5.31 SUs. Thus, Pacific FFS and West PGP have the highest values because of a combination of a high proportion of patients receiving tests as well as a high hospital admission rate. As discussed earlier, the high proportion of admissions for diagnostic workups implies that the use of a constant SU for all admissions creates a serious bias. In addition, the hospital admission rate on Table B.1 as well as the hospital admission SUs and total SUs on Table B.2 are biased upward for Central FFS because one patient was admitted to the hospital four times. This is the only instance among all 203 ulcer patients in which more than one admission occurred.

Differences among sites for laboratory tests or profiles were not significant. However, Central IPA, a site with low utilization in general, also was low for lab procedures. X-rays, which are done to determine the location and extent of an ulcer, also varied across sites from about 0.07 per patient at three sites to almost half the patients at Central IPA. However, since no fiberoptic exams were done at Central IPA, X-rays and fiberoptic exams may be used as substitutes at this site.

Three sites stand out as having generally high utilization across all measures, West PGP, Pacific FFS, and Central FFS. However, contrary to expectations of higher utilization at all FFS sites, Midwest FFS showed low average values for all measures except lab tests and lab profiles. Nevertheless, the average of all FFS practices is still higher compared to IPA and PGP practices across all utilization measures except GI series using either counts (Table B.3) or standardized units (Table B.4)

When the practice sites are grouped according to organizational categories, differences in mean number of lab tests and medications remain insignificant. However, for GI series where there are no significant differences among individual sites, peer interaction/quality assurance and utilization review and practice type are significant (Table B.3)

Each of the four sets of organizational variables was designed so that a higher value means more control of utilization and, in turn, lower mean utilization values. However, this pattern generally is not found for duodenal ulcer. For example, hospital admissions are highest for UR=2, lowest for UR=1, and in the middle for UR=0. Lab profiles are opposite the expected pattern for utilization review with UR=0 highest, UR=1 in the middle and UR=2 lowest (Table B.3). These deviations from expected patterns may be explained by the fact that Pacific FFS and Central FFS, two sites with generally high utilization, are classified as UR=0.

Regression Analysis

In the first stage regression analysis for duodenal ulcer, sex, patient age (under 50, 51-64, and 65 or over), and geographic region were used in a regression with all 201 patients (Table B.5). Age and sex were significant for standardized office visits, and age was significant for ambulatory care. Utilization is lower for those under 50 or over 65 compared to those aged 51-64. Geographic region also was significant for all four measures of utilization.

The ratio of expected to actual utilization was aggregated over all the patients at each site and these site specific variables became the dependent variables for the regressions presented in Table B.6. For all four measures, standard utilization of office visits, ambulatory care, hospital

admissions, and total, FFS is highest in Table B.4, which shows raw data. After controlling for sex, age, and geographic region, only differences among practice types for ambulatory care remain significant (Table B.6). In fact, with the exception of significant differences in ambulatory care utilization by utilization review category, all of the significant variation within organizational characteristics become insignificant when sex, age, and region are held constant (Table B.6). However, when practice type is added to these regressions, some organizational variables become significant. For example, in standardized hospital admissions and total utilization, both DM=1 and DM=2 are the highest when no adjustments are made (Table B.4). For peer interaction/quality assurance, no significant differences are seen for standardized hospital admissions or total utilization on Table B.4, while significant differences are shown on Table B.6. However, the R^2 values for some of these regressions, in the range of .90 even after adjustment for degrees of freedom, are so high as to be questionable.

One reason that the raw data shown on Table B.4 may be misleading concerns the number of sites available for study. While the original study design called for three sites in each region and five sites of each practice type, this goal was not achieved. For all six diagnoses, no Atlantic FFS data were collected. For duodenal ulcer, an additional five sites were deleted because of insufficient data. The deletion of these six sites left

the following configuration of sites by practice type, region, and organization categories:

<u>Practice Type</u>	<u>Region</u>	<u>Decisionmaking</u>
PGP - 3 sites	Pacific - 1 site	DM=0 - 3 sites
IPA - 2 sites	West - 3 sites	DM=1 - 5 sites
FFS - 4 sites	Midwest - 2 sites	DM=2 - 1 site
	Central - 3 sites	
	Atlantic - no sites	

<u>Peer Interaction/ Quality Assurance</u>	<u>Utilization Review</u>	<u>Financial Incentives</u>
PI/QA=0 - 1 site	UR=0 - 4 sites	FI=-2 - 3 sites
PI/QA=1 - 2 sites	UR=1 - 4 sites	FI= 0 - 4 sites
PI/QA=2 - 2 sites	UR=2 - 1 site	FI= 1 - no sites
PI/QA=3 - 4 sites		FI= 2 - 2 sites

The reason that these missing sites may present a problem can be demonstrated through an example. There are only two practice sites in the Midwest - Midwest PGP and Midwest FFS - both of which show relatively low utilization. If data were available for Midwest IPA and if regional patterns of utilization exist, then utilization at Midwest IPA also would be relatively low. However, with Midwest IPA missing, the "low" Midwest utilization only enters the means for PGP and FFS and not for IPA on Table B.4. Thus, this lack of the same number of sites in each region may cause systematic problems.

In addition, the small number of sites limits the confidence in the regression results shown on Table B.6. The extremely high adjusted R² for equations with both practice type and organizational characteristics is caused both by large variation in the raw data, and by using 5 or more variables in a regression with only 9 observations. With the small number of sites, the combination of practice type and organizational characteristics may allow some of the sites with more extreme values to, in essence, be uniquely identified. Thus, the regression results should be viewed with substantial skepticism.

TABLE B.1 DUODENAL ULCER -- MEAN UTILIZATION BY PRACTICE SITE

PRACTICE SITE	# OF PATIENTS	OFFICE VISITS	MEDI-CATIONS	HOSP. ADMITS	LAB TESTS	LAB PROFILES	X-RAYS	G I SERIES	FIBEROP-TIC EXAM
PACIFIC PGP+	--	---	---	---	---	---	---	---	---
PACIFIC IPA+	--	---	---	---	---	---	---	---	---
PACIFIC FFS	25	2.92**	1.28	0.64**	0.76	1.04	0.36**	0.60	0.36**
WEST PGP	25	1.68	1.32	0.56	0.96	0.20	0.08	0.72	0.40
WEST IPA	27	1.70	(a)	0.19	1.11	0.41	0.07	0.15	0.07
WEST FFS	10	1.80	2.30	0.30	1.00	0.70	0.30	0.40	0.20
MIDWEST PGP	24	1.54	1.46	0.08	0.75	0.33	0.08	0.42	0.04
MIDWEST IPA+	--	---	---	---	---	---	---	---	---
MIDWEST FFS	19	1.21	1.47	0.05	1.32	0.68	0.16	0.37	0.05
CENTRAL PGP	21	1.90	1.24	0.10	0.43	0.67	0.19	0.48	0.14
CENTRAL IPA	26	2.15	(a)	0.04	0.54	0.15	0.46	0.27	0.00
CENTRAL FFS	26	2.46	1.88	0.50	1.23	0.38	0.73	0.50	0.23
ATLANTIC PGP+	--	---	---	---	---	---	---	---	---
ATLANTIC IPA+	--	---	---	---	---	---	---	---	---

TOTAL: 203

Differences among the sites are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all sites.

* Differences among the sites are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all sites.

Under ten patient records were obtained for T1 at this site.

Prescribed medication data are omitted for West IPA and Central IPA because of coding errors and lack of medication data on claims forms.

TABLE B.1.b PERCENTAGE OF PATIENTS AT EACH SITE WITH 0, 1, 2, AND 3 OR MORE
PRESCRIBED MEDICATIONS FOR DUODENAL ULCER

PRACTICE SITE	# OF PATIENTS	NUMBER OF PRESCRIBED MEDICATIONS DURING THE T1 TIME PERIOD				Total
		0	1	2	3 or more	
PACIFIC PGP+	--	--	--	--	--	
PACIFIC IPA+	--	--	--	--	--	
PACIFIC FFS	25	28%	32%	28%	12%	100%
WEST PGP	25	32	32	24	12	100
WEST IPA(a)	27	--	--	--	--	--
WEST FFS	10	10	30	20	40	100
MIDWEST PGP	24	4	59	25	12	100
MIDWEST IPA+	--	--	--	--	--	--
MIDWEST FFS	19	26	26	32	16	100
CENTRAL PGP	21	19	38	43	--	100
CENTRAL IPA(a)	26	--	--	--	--	--
CENTRAL FFS	26	12	19	50	19	100
ATLANTIC PGP+	--	--	--	--	--	--
ATLANTIC IPA	--	--	--	--	--	--
TOTAL: 203						

+ Under 10 patient records were obtained for T1 at this site.

a. Prescribed medication data are omitted for West IPA and Central IPA because of coding errors and lack of medication data on claims forms.

TABLE B.1.c PERCENTAGE OF PATIENTS ADMITTED AND RECEIVING PROCEDURES
FOR DUODENAL ULCER

PRACTICE SITE	# OF PATIENTS	NO HOSPITAL ADMIT & NO PROCEDURES	HOSPITAL ADMIT & NO PROCEDURES	GI SERIES OR FIBEROPTIC EXAM & NO HOSP. ADMIT	HOSP. ADMIT AND GI SERIES OR FIBEROPTIC EXAM	TOTAL
PACIFIC PGP+	--	---	---	---	---	---
PACIFIC IPA+	--	---	---	---	---	---
PACIFIC FFS	25	4%	20%	28%	48%	100%
WEST PGP	25	12	32	--	56	100
WEST IPA	27	81	---	--	19	100
WEST FFS	10	60	10	10	20	100
MIDWEST PGP	24	50	4	42	4	100
MIDWEST IPA+	--	---	---	---	---	---
MIDWEST FFS	19	63	---	32	5	100
CENTRAL PGP	21	33	9	57	--	100
CENTRAL IPA	26	69	4	27	--	100
CENTRAL FFS	26	19	23	46	12	100
ATLANTIC PGP+	--	---	---	---	---	---
ATLANTIC IPA+	--	---	---	---	---	---

+ Under 10 patient records were obtained for T1 at this site.

Note: Totals may not add to exactly 100% due to rounding.

TABLE B.2 DUODENAL ULCER -- MEAN STANDARDIZED UTILIZATION BY PRACTICE SITE

PRACTICE	NUMBER OF PATIENTS	OFFICE VISITS	MEDICATIONS	AMBULATORY CARE-TOTAL (c)	SPECIAL PROCEDURES	HOSPITAL ADMISSIONS	TOTAL W/MEDS (d)	TOTAL W/OUT MEDS (e)
FIC PGP+	--	---	---	---	---	---	---	---
FIC IPA+	--	---	---	---	---	---	---	---
FIC FFS	25	3.61**	2.48	6.59**	11.33**	247.47**	267.88**	265.40**
PGP	25	2.31	2.56	3.23	12.87	216.54	235.20	232.64
IPA	27	2.61	(b)	4.39	2.46	71.61	(b)	78.46
FFS	10	2.75	4.46	5.47	6.65	116.00	132.59	128.12
EST PGP	24	1.76	2.83	2.32	3.15	32.22	40.52	37.70
EST IPA+	--	---	---	---	---	---	---	---
EST FFS	19	1.52	2.86	3.99	3.15	20.35	30.35	27.49
RAL PGP	21	2.14	2.40	3.72	5.76	36.83	48.71	46.31
RAL IPA	26	2.15	(b)	4.20	1.43	15.47	(b)	20.50
RAL FFS	26	2.79	3.66	7.03	7.88	193.33	211.90	208.25
NTIC PGP+	--	---	---	---	---	---	---	---
NTIC IPA+	--	---	---	---	---	---	---	---

TOTAL: 203

Differences among the sites are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all sites.

Differences among the sites are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all sites.

Under ten patient records were obtained for T1 at this site.

Standardized unit values are missing because of missing raw data.

Ambulatory care standardized units (SU) = (office visits SU + lab profile SU + lab test SU + X-rays SU + other procedures SU)

Total standardized units (SU) = (ambulatory care SU + prescribed medications SU + special procedures SU + hospital admissions SU)

Total standardized units without medications = (ambulatory care SU + special procedures SU + hospital admissions SU)

West IPA and Central IPA are included because only medications data is missing.

TABLE B.3 DUODENAL ULCER -- MEAN UTILIZATION BY PRACTICE TYPE, REGION,
AND ORGANIZATIONAL CHARACTERISTICS

PRACTICE SITE	# OF PATIENTS	OFFICE VISITS	MEDI- CATIONS	HOSP. ADMITS	LAB TESTS	LAB PROFILES	X-RAYS	G I SERIES	FIBEROP- TIC EXAM
P	70(f)	1.70**	1.34	0.26**	0.73	0.39**	0.11**	0.59**	0.20**
A	539	1.92	---	0.12	0.83	0.28	0.26	0.21	0.04
S	80	2.23	1.65	0.41	1.07	0.70	0.42	0.49	0.23
GeOGRAPHIC REGION									
CIFIC	25	2.92*	1.28	0.64**	0.76	1.04**	0.36**	0.60	0.36**
ST	62(f)	1.71	1.60	0.35	1.03	0.37	0.11	0.42	0.23
DWEST	43	1.40	1.47	0.07	1.00	0.49	0.12	0.40	0.05
NTRAL	73(f)	2.19	1.59	0.22	0.75	0.38	0.48	0.41	0.12
LANTIC	--	---	---	---	---	---	---	---	---
DecisionMAKING (DM)									
=0	50	1.62**	1.54	0.12**	0.88	0.68**	0.20	0.42	0.12**
=1	128(f)	1.91	1.56	0.28	0.92	0.30	0.29	0.41	0.15
=2	25	2.92	1.28	0.64	0.76	1.04	0.36	0.60	0.36
PER INTERACTION/QUALITY ASSURANCE (PI/QA)									
/QA=0	27(f)	1.70**	---	0.19	1.11	0.41**	0.07**	0.15**	0.07**
/QA=1	52(f)	2.31	1.88	0.27	0.88	0.27	0.60	0.38	0.12
/QA=2	49	1.61	1.39	0.33	0.86	0.27	0.08	0.57	0.22
/QA=3	75	2.05	1.45	0.29	0.84	0.80	0.25	0.48	0.20
UTILIZATION REVIEW (UR)									
=0	80	2.23**	1.65	0.41**	1.07	0.70**	0.42**	0.49**	0.23**
=1	98(f)	1.83	1.35	0.10	0.72	0.38	0.20	0.32	0.06
=2	25	1.68	1.32	0.56	0.96	0.26	0.08	0.72	0.40
FINANCIAL INCENTIVES (FI)									
=-2	54	2.11**	1.54	0.36**	1.00	0.85**	0.28**	0.48	0.22*
=0	97(f)	1.71	0.97	0.24	0.84	0.39	0.10	0.43	0.16
=1	--	---	---	---	---	---	---	---	---
=2	52(f)	2.30	1.88	0.27	0.88	0.27	0.59	0.38	0.11

Differences among the categories are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all categories.

Differences among the categories are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all categories.

West IPA and Central IPA are missing all medications data. Therefore, the N of patients for medications and total standard units with medications is lower than indicated for categories which include these sites.

TABLE B.4 DUODENAL ULCER -- MEAN STANDARDIZED UNITS BY PRACTICE TYPE, REGION,
AND ORGANIZATIONAL CHARACTERISTICS

PRACTICE TYPE	NUMBER OF PATIENTS	OFFICE VISITS	MEDI-CATIONS	AMBULATORY CARE-TOTAL	SPECIAL PROCEDURES	HOSPITAL ADMISSIONS	TOTAL W/MED	TOTAL W/OUT MEDS
PO	70	2.07**	2.61	3.06**	7.41**	99.43**	112.51*	109.90*
AS	53(f)	2.39	---	4.29	1.96	44.62	--	50.02
SS	80	2.74	3.20	5.98	7.68	159.50	176.36	173.16
GEOGRAPHIC REGION								
POCIFIC	25	3.61**	2.48	6.59**	11.33**	247.47**	267.84**	265.40**
ST	62(f)	2.51	3.10	4.09	7.34	137.21	205.88	148.64
OWEST	43	1.66	2.84	3.06	3.15	26.98	36.03	33.19
ENTRAL	73(f)	3.38	3.09	5.07	4.97	85.93	138.99	94.79
ANTIC	--	---	---	---	---	---	---	---
DECISIONMAKING (DM)								
=0	50	2.03**	2.99	4.18**	4.94**	46.40**	58.51**	55.52**
=1	128(f)	2.34	3.03	4.27	5.52	106.56	164.83	115.52
=2	25	3.61	2.48	6.59	11.33	247.47	267.88	265.40
PRACTICE INTERACTION/QUALITY ASSURANCE (PI/QA)								
/QA=0	27	2.61	---	4.39**	2.46**	71.61	---	78.46
/QA=1	52(f)	2.47	3.65	5.61	4.65	106.15	211.90	114.37
/QA=2	49	2.04	2.69	2.78	8.11	126.26	139.85	137.16
/QA=3	75	2.56	2.82	4.98	7.07	113.43	128.30	125.48
UTILIZATION REVIEW (UR)								
=0	80	2.74**	3.20	5.98**	2.68**	159.50**	176.36**	173.16**
=1	98(f)	2.18	2.63	3.69	3.06	39.86	44.34	46.21
=2	25	2.31	2.56	3.23	12.87	216.54	235.20	232.64
FINANCIAL INCENTIVES (FI)								
=-2	54	2.72	2.98	5.47**	7.58**	143.21**	159.25**	156.27**
=0	97(f)	2.22	2.87	3.43	6.03	91.68	103.03	101.14
=1	--	---	---	---	---	---	---	---
=2	52(f)	2.47	3.66	5.61	4.65	106.15	114.37	118.03

Differences among the categories are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all categories.

Differences among the categories are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all categories.

West IPA and Central IPA are missing all medications data. Therefore, the N of patients for medications and total standard units with medications is lower than indicated for categories which include these sites.

TABLE B. 5 UTILIZATION OF SERVICES FOR ULCER PATIENTS AS A
FUNCTION OF PATIENT SEX, AGE, AND PRACTICE GEOGRAPHIC REGION

	OFFICE VISITS (SUOV)	AMBULATORY CARE (SUAC)	HOSPITAL ADMISSIONS (SUADM)	TOTAL UTILIZATION (WITHOUT MEDS) (TSU)
MALE	-0.1211** (0.1927)	-0.8655 (0.5607)	3.5240 (26.8911)	4.2913 (27.2597)
AGE LT 50	-0.5199* (0.3132)	-2.0592 (0.9111)	34.7106 (43.6929)	35.2445 (44.2918)
AGE GT 65	-0.3305 (0.2229)	-1.3471** (0.6484)	-40.2186 (31.0961)	-42.4230 (31.5223)
PACIFIC	1.9366** (0.3517)	3.3738** (1.0232)	196.40** (49.0707)	207.220** (49.7432)
WEST	0.8714** (0.2725)	0.8365 (0.7929)	97.7411** (38.0262)	102.451** (38.5474)
CENTRAL	0.6509** (0.2624)	1.7167** (0.7635)	58.1851 (36.6169)	61.8152* (37.1188)
INTERCEPT	2.0242** (0.3017)	4.7445** (0.8778)	49.8873 (42.0982)	57.1790 (42.6752)
R ²	0.14	0.08	0.10	0.11
N	201	201	201	201

* Indicates statistical significance at the 0.10 confidence level.

** Indicates statistical significance at the 0.05 confidence level.

(Standard errors are shown in parentheses)

TABLE B.6 DIFFERENCE BETWEEN ACTUAL AND EXPECTED UTILIZATION
FOR ULCER PATIENTS AS A FUNCTION OF PRACTICE TYPE AND
ORGANIZATIONAL CHARACTERISTICS

INDEPENDENT VARIABLES -----	OFFICE VISITS (SUOV)	AMBULATORY CARE (SUAC)	HOSPITAL ADMISSIONS (SUADM)	TOTAL UTILIZATION (WITHOUT MEDS) (TSU)
PRACTICE TYPE -----				
IPA	-0.0090 (0.0822)	0.1263 (0.1391)	-0.8210 (0.5499)	-0.7671 (0.5026)
FFS	0.1019 (0.0739)	0.5034** (0.1250)	0.0841 (0.4943)	0.1137 (0.4517)
INTERCEPT	-0.0365 (0.0539)	-0.2240** (0.0913)	0.1874 (0.3610)	0.1565 (0.3299)
ADJUSTED R ²	0.08	0.66	0.13	0.17
DECISION MAKING (DM) -----				
DM=0	-0.0532 (0.0879)	0.1620 (0.2436)	-0.6139 (0.5729)	-0.5257 (0.5408)
DM=2	-0.0164 (0.1152)	0.0371 (0.3194)	-0.1796 (0.7511)	-0.1488 (0.7091)
INTERCEPT	0.0164 (0.0466)	-0.0371 (0.1291)	0.1796 (0.3036)	0.1488 (0.2866)
ADJUSTED R ²	-0.26	-0.24	-0.12	-0.15
PEER INTERACTION/QUALITY ASSURANCE (PI/QA) -----				
PI/QA=0	0.0354 (0.1273)	-0.0875 (0.3217)	-0.1628 (0.7624)	-0.1962 (0.7202)
PI/QA=1	0.0697 (0.1024)	0.0311 (0.2587)	0.4829 (0.6130)	0.4294 (0.5791)
PI/QA=2	0.0135 (0.1042)	-0.2993 (0.2633)	0.8028 (0.6240)	0.6975 (0.5894)
INTERCEPT	-0.0245 (0.0655)	0.0833 (0.1655)	-0.2896 (0.3922)	-0.2512 (0.3705)
ADJUSTED R ²	-0.45	-0.19	-0.09	-0.12
UTILIZATION REVIEW (UR) -----				
UR=0	0.1242 (0.1030)	0.4412* (0.1867)	-0.2928 (0.7143)	-0.2823 (0.6406)
UR=1	0.0230 (0.1009)	-0.0096 (0.1825)	-0.9173 (0.6985)	-0.9119 (0.6265)
INTERCEPT	-0.0587 (0.0901)	-0.1618 (0.1629)	0.5645 (0.6235)	0.5526 (0.5592)
ADJUSTED R ²	0.08	0.61	0.08	0.14

TABLE 6 - ULCER (cont.)

INDEPENDENT VARIABLES -----	(SUOV)	(SUAC)	(SUADM)	(TSU)
FINANCIAL INCENTIVES (FI) -----				
FI=0	-0.0265 (0.0879)	-0.3729 (0.1976)	-0.1887 (0.6226)	-0.1352 (0.5808)
FI=2	0.0419 (0.1006)	-0.0957 (0.2261)	0.3725 (0.7125)	0.3250 (0.6646)
INTERCEPT	0.0032 (0.0705)	0.2100 (0.1584)	-0.1794 (0.4990)	-0.1468 (0.4655)
ADJUSTED R2	-0.21	0.21	-0.27	-0.28
PRACTICE TYPE AND DECISION MAKING -----				
IPA	-0.0495 (0.0707)	0.1175 (0.0761)	-1.2129** (0.1800)	-0.1212** (0.1780)
FFS	0.1623* (0.0687)	0.6370** (0.0740)	0.5045** (0.1749)	0.5048** (0.1729)
DM=0	-0.1349 (0.0696)	-0.0293 (0.0750)	-1.3063** (0.1772)	-1.1802** (0.1752)
DM=2	-0.1663 (0.0968)	-0.4218** (0.1042)	-1.0839** (0.2463)	-1.0154** (0.2435)
INTERCEPT	0.0039 (0.0490)	-0.2152 (0.0528)	0.5793** (0.1248)	0.5105** (0.1234)
ADJUSTED R2	0.38	0.90	0.92	0.90
PRACTICE TYPE AND PEER INTERACTION/QUALITY ASSURANCE -----				
IPA	-0.1997 (0.1196)	-0.1652 (0.3249)	-1.6368** (0.2917)	-1.5438** (0.2787)
FFS	0.0992 (0.0813)	0.4527 (0.2209)	0.3933 (0.1983)	0.3728 (0.1894)
PI/QA=0	0.3065* (0.1150)	0.4037 (0.3126)	1.7571** (0.2807)	1.6161** (0.2682)
PI/QA=1	0.1914* (0.0755)	0.2133 (0.2050)	1.3879** (0.1840)	1.2834** (0.1759)
PI/QA=2	0.0849 (0.0825)	0.2667 (0.2240)	1.0860** (0.2011)	0.9659** (0.1922)
INTERCEPT	-0.0959 (0.0690)	0.2426 (0.1874)	-0.5727** (0.3683)	-0.5196** (0.1608)
ADJUSTED R2	0.55	0.57	0.94	0.94

TABLE 6 - ULCER (cont.)

INDEPENDENT VARIABLES -----	(SUOV)	(SUAC)	(SUADM)	(TSU)
PRACTICE TYPE AND UTILIZATION REVIEW -----				
IPA	-0.0214 (0.0995)	0.1609 (0.1657)	-0.6115 (0.6359)	-0.5472 (0.5706)
FFS	0.1242 (0.1125)	0.4413 (0.1876)	-0.2928 (0.7188)	-0.2823 (0.6449)
UR=1	0.0346 (0.1225)	-0.0966 (0.2043)	-0.5865 (0.7825)	-0.6160 (0.7021)
INTERCEPT	-0.0587 (0.0981)	-0.1618 (0.1637)	0.5645 (0.6274)	0.5526 (0.5629)
ADJUSTED R2	-0.09	0.61	0.07	0.13

PRACTICE TYPE AND FINANCIAL INCENTIVES

IPA	0.0474 (0.0721)	0.2197 (0.1689)	-0.6399 (0.4953)	-0.6039* (0.4437)
FFS	0.3462** (0.1140)	0.8377** (0.2670)	1.3902 (0.7829)	1.3127 (0.7014)
FI=0	0.3065 (0.1159)	0.4036 (0.2714)	1.7571 (0.7958)	1.6160 (0.7129)
FI=2	0.1913 (0.0760)	0.2132 (0.1779)	1.3879* (0.5219)	1.2833* (0.4675)
INTERCEPT	-0.3430** (0.1220)	-0.6276* (0.2357)	-1.5697 (0.8376)	-1.4595 (0.7503)
ADJUSTED R2	0.54	0.67	0.55	0.58

*Indicates statistically significant results at the 0.10 confidence level.

**Indicates statistically significant results at the 0.05 confidence level.

Note: For all regressions the number of observations is 9

(Standard errors are shown in parentheses)

C. OTITIS MEDIA

Descriptive Analysis

Only three patients of the 360 for whom utilization data are available were hospitalized. Therefore, this analysis does not include hospital admissions. Additionally, only two patients were coded as having had the procedure, myringotomy, and thus, this data is excluded from the analysis.

Mean utilization values by site for otitis media appear in Table C.1 and mean standardized unit values appear in Table C.2. Office visits, lab tests, and X-rays are significantly different across practice sites. (Table C.1). Using standardized values, office visits, medications, and total ambulatory care are significant. (Table C.2).

Office visits range from a low mean value of 1.29 to a high of 2.77. Although this difference is statistically significant, there are no sites with unusually high or low values. However, one should note that there is a minimum of one visit necessary for inclusion in the sample. Thus, if one examines the proportion of patients at each site with no follow-up visits, the range is from 0.31 to 0.79, a difference of 48 percentage points. (See Table C.1.b.) Two sites have no recorded data for medications. Excluding these two sites, mean values for prescribed medications range from 1.50 to 2.62, again, a statistically significant difference but a narrow range of values (Table C.1).

Two sites have unusually high mean values for X-rays of 0.18 and 0.25. Six of the 13 sites performed no X-rays on otitis media patients, with the other 5 sites' values ranging from 0.03 to 0.12.

Lab tests are significant at the 0.05 level. One site had an unusually high value of 0.33, while the values for the remaining sites ranged from 0.0 to 0.21, with most of the values between 0.07 and 0.17. Lab profiles showed no significant differences in mean values.

When the sites are grouped by organizational factors, few changes occur in the significance of the variables (Table C.3). Office visits are significant at the 0.05 confidence level by practice type. The largest proportion of patients with no return visits were in PGPs, with 63 percent

of the patients having only one visit (Table C.1.b). IPAs and FFSs both had 52 percent of patients with exactly one visit. When sites are grouped by geographic region, the Central and Midwest regions have the highest percentage of patients with only one visit, with 69 percent and 60 percent respectively. The Pacific region has the lowest proportion of patients with only one visit (0.44), while the Atlantic region has a mean value of 0.49, and the West has a value of 0.57.

Looking at Table C.3, PGPs show a lower value for office visits and a higher value for medications than either IPAs or FFS practices. This may be because it is less expensive for the PGPs to give a prescription than to give additional office visits, while for the other practice types, medications generally would not affect the income of the group, but additional office visits would. It may also be a reflection of the fact that some HMOs cover prescription drugs, and thus may be more consistent in recording the data. X-rays are significant at the 0.10 level by practice type, with FFS groups ordering more X-rays than IPAs or PGPs.

The use of medications and X-rays show significant differences by geographic region. Office visits are significant for centralization of decisionmaking and peer interaction/quality assurance. Medications are significant for peer interaction/quality assurance, and financial incentives. Lab tests are significant at the 0.10 level for peer interaction/-quality assurance and the 0.05 level for financial incentives. X-rays are significant at the 0.10 level for peer interaction/quality assurance and for financial incentives.

Regression Analysis

In the first stage of the regression analysis, patient age and geographic region were used to predict expected utilization for SUOV and SUAC. The results are shown in Table C.5. Because only three of the 360 patients were hospitalized and only two received the special procedure, myringotomy, no analysis for hospital admissions or total standardized units was done for otitis media. Total ambulatory care and total utilization are the same when special procedures and hospital admissions are excluded.

Patient age was divided into three categories - less than one year, 1-4 years (the excluded variable), and 5 or more years. Both patient age and geographic region were significant in predicting utilization for office visits and ambulatory care. Patients 1-4 years old had higher utilization than both younger and older patients. Those in the West and Atlantic regions had the highest utilization, with the Midwest, Pacific, and Central regions following respectively.

These expected utilization values for each site were then tested in the second stage of the regression analysis against practice type and the other organizational characteristics (Table C.6). All of the statistically significant variation that was evident on Table C.4 disappeared when region and age were controlled for. Only peer interaction/quality assurance continue to show any significant difference among groups.

TABLE C.1 - OTITIS MEDIA -- MEAN UTILIZATION BY PRACTICE SITE

PRACTICE SITE	# OF PATIENTS	OFFICE VISITS	MEDI-CATIONS	LAB TESTS	LAB PROFILES	X-RAYS
PACIFIC PGP	28	1.68**	1.71	0.00*	0.00	0.00**
PACIFIC IPA	28	1.89	1.61	0.00	0.00	0.00
PACIFIC FFS	29	2.41	2.62	0.07	0.07	0.00
WEST PGP	30	1.50	2.23	0.03	0.03	0.03
WEST IPA	30	2.77	(a)	0.33	0.03	0.00
WEST FFS+	--	---	---	---	---	---
MIDWEST PGP	24	1.71	1.88	0.17	0.04	0.04
MIDWEST IPA	28	1.54	1.64	0.11	0.04	0.18
MIDWEST FFS	28	1.29	1.50	0.11	0.04	0.07
CENTRAL PGP	29	1.34	1.83	0.21	0.03	0.03
CENTRAL IPA	29	1.38	2.00	0.07	0.00	0.00
CENTRAL FFS	28	1.54	1.57	0.11	0.00	0.25
ATLANTIC PGP+	24	1.46	2.21	0.17	0.00	0.00
ATLANTIC IPA+	25	2.04	(a)	0.12	0.04	0.12

TOTAL: 360

* Differences among the sites are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all sites.

** Differences among the sites are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all sites.

+ Under ten patient records were obtained for T1 at this site.

a Prescribed medications data are low for West IPA and Atlantic IPA because of coding errors and lack of medications data on claims form.

Note: There were only three admissions out of 360 patients so hospital admissions are not shown on this table.

TABLE C.1.b
PROPORTION OF OTITIS MEDIA PATIENTS WITH EXACTLY ONE OFFICE VISIT;
BY SITE, PRACTICE TYPE AND GEOGRAPHIC REGION

PRACTICE SITE		PRACTICE TYPE		GEOGRAPHIC REGION	
PACIFIC PGP	0.57	PGP	0.63	PACIFIC	0.44
PACIFIC IPA	0.43	IPA	0.52	WEST	0.57
PACIFIC FFS	0.31	FFS	0.52	MIDWEST	0.60
WEST PGP	0.70			CENTRAL	0.69
WEST IPA	0.43			ATLANTIC	0.49
MIDWEST PGP	0.42				
MIDWEST IPA	0.64				
MIDWEST FFS	0.71				
CENTRAL PGP	0.79				
CENTRAL IPA	0.72				
CENTRAL FFS	0.54				
ATLANTIC PGP	0.63				
ATLANTIC IPA	0.36				

E C.2 OTITIS MEDIA -- MEAN STANDARDIZED UTILIZATION BY PRACTICE SITE

PRACTICE SITE	NUMBER OF PATIENTS	OFFICE VISITS	PRESCRIBED MEDICATIONS	AMBULATORY CARE-TOTAL (c)
PACIFIC PGP	28	1.66*	0.69**	1.66**
PACIFIC IPA	28	1.83	0.64	1.83
PACIFIC FFS	29	2.50	1.05	2.57
WEST PGP	30	1.43	0.89	1.49
WEST IPA	30	3.58	(b)	3.97
WEST FFS+	--	---	---	---
MIDWEST PGP	24	1.76	0.75	1.95
MIDWEST IPA	28	1.48	0.65	1.94
MIDWEST FFS	28	1.27	0.60	1.59
CENTRAL PGP	29	1.42	0.73	1.67
CENTRAL IPA	29	1.33	0.80	1.41
CENTRAL FFS	28	1.57	0.63	2.06
ATLANTIC PGP	24	1.42	0.88	1.61
ATLANTIC IPA	25	2.69	(b)	3.02

TOTAL: 199

- * Differences among the sites are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all sites.
- ** Differences among the sites are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all sites.
- + Under ten patient records were obtained for T1 at this site.
- b. Standardized unit values are missing because of missing raw data. See Table 1 for details.
- c. Ambulatory care standardized units (SU) = (office visits SU + lab profile SU + X-rays SU + other procedures SU)

TABLE C.3 OTITIS MEDIA -- MEAN UTILIZATION BY PRACTICE TYPE, REGION,
AND ORGANIZATIONAL CHARACTERISTICS

PRACTICE SITE	# OF PATIENTS	OFFICE VISITS	MEDI- CATIONS	LAB TESTS	LAB PROFILES	X-RAYS
PGP	135	1.54**	1.97	0.11	0.02	0.02*
IPA	140(f)	1.92	1.75	0.13	0.02	0.06
FFS	85	1.75	1.91	0.09	0.04	0.11
GEOGRAPHIC REGION						
PACIFIC	85	2.00	1.99*	0.02	0.02	0.00**
WEST	60(f)	2.13	2.23	0.18	0.03	0.02
MIDWEST	80	1.50	1.66	0.13	0.04	0.10
CENTRAL	86	1.43	1.80	0.13	0.01	0.09
ATLANTIC	49(f)	1.76	2.21	0.14	0.02	0.06
DECISIONMAKING (DM)						
DM=0	51	1.33**	1.67**	0.16	0.04	0.05
DM=1	221(f)	1.73	1.87	0.12	0.02	0.06
DM=2	82(f)	2.05	2.18	0.06	0.04	0.04
PEER INTERACTION/QUALITY ASSURANCE (PI/QA)						
PI/QA=0	55(f)	2.44**	(f)**	0.24*	0.04	0.05*
PI/QA=1	113	1.55	1.71	0.07	0.01	0.11
PI/QA=2	78	1.55	2.12	0.12	0.03	0.03
PI/QA=3	114	1.69	1.92	0.10	0.04	0.03
UTILIZATION REVIEW (UR)						
UR=0	113	1.74	1.86	0.07	0.03	0.08
UR=1	192(f)	1.74	1.86	0.15	0.02	0.04
UR=2	55(f)	1.75	2.23	0.07	0.04	0.07
FINANCIAL INCENTIVES (FI)						
FI=-2	57	1.86	2.07**	0.09**	0.05	0.04
FI=0	113(f)	1.85	1.98	0.19	0.04	0.03
FI=1	108	1.65	1.77	0.06	0.00	0.04
FI=2	82(f)	1.63	1.78	0.09	0.01	0.12

* Differences among the categories are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all categories.

** Differences among the categories are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all categories.

f. West IPA and Atlantic IPA are missing medications data. Therefore, mean values for medications are calculated without these sites. The N of patients for medications is lower than indicated for categories which include these two sites

Note: There were only three admissions out of 360 patients so hospital admissions are not shown on this table.

TABLE C.4 OTITIS MEDIA -- MEAN STANDARDIZED UNITS BY PRACTICE TYPE, REGION,
AND ORGANIZATIONAL CHARACTERISTICS

PRACTICE TYPE -----	NUMBER OF PATIENTS	OFFICE VISITS	MEDI- CATIONS	AMBULATORY CARE-TOTAL
PGP	135	1.53**	0.79	1.67**
IPA	140(f)	2.19	0.70	2.44
FFS	85	1.79	0.76	2.06
GEOGRAPHIC REGION -----				
PACIFIC	85	2.00**	0.80*	2.02**
WEST	60(f)	2.51	0.89	2.73
MIDWEST	80	1.49	0.66	1.80
CENTRAL	86	1.44	0.72	1.71
ATLANTIC	49(f)	2.07	0.88	2.33
DECISIONMAKING (DM) -----				
DM=0	57	1.34	0.67**	1.61**
DM=1	221(f)	1.82	0.75	2.05
DM=2	82(f)	2.27	0.87	2.39
PEER INTERACTION/QUALITY ASSURANCE (PI/QA) -----				
PI/QA=0	55(f)	3.18**	(f)**	3.54**
PI/QA=1	113	1.55	0.68	1.81
PI/QA=2	78	1.53	0.85	1.67
PI/QA=3	114	1.71	0.77	1.86
UTILIZATION REVIEW (UR) -----				
UR=0	113	1.76	0.74	1.96
UR=1	192(f)	1.86	0.74	2.08
UR=2	55(f)	2.00	0.89	2.18
FINANCIAL INCENTIVES (FI) -----				
FI=-2	57	1.89	0.83**	2.06**
FI=0	113(f)	2.07	0.79	2.29
FI=1	108	1.60	0.71	1.77
FI=2	82(f)	1.83	0.72	2.12

* Differences among the categories are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all categories.

** Differences among the categories are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all categories.

f. West IPA and Atlantic IPA are missing medications data. Therefore, mean values for medications are calculated without these sites. The N of patients for medications is lower than indicated for categories which include these two sites.

TABLE C. 5 UTILIZATION OF SERVICES FOR OTITIS MEDIA AS A
FUNCTION OF PATIENT AGE, AND PRACTICE GEOGRAPHIC REGION

	OFFICE VISITS (SUOV)	AMBULATORY CARE (SUAC)
AGE LT 1	-0.1028 (0.7479)	-0.2008 (0.8698)
AGE GT 4	-0.6777** (0.1634)	-0.7050** (0.1901)
PACIFIC	0.2571 (0.2380)	0.0401 (0.2768)
WEST	0.9336** (0.2517)	0.8379** (0.2927)
CENTRAL	-0.0816 (0.2285)	-0.1237 (0.2657)
ATLANTIC	0.6001** (0.2666)	0.5509* (0.3100)
INTERCEPT	1.9228** (0.1945)	2.2542** (0.2262)
ADJUSTED R2	0.09	0.06
N	360	360

* Indicates statistical significance at the 0.10 confidence level.

** Indicates statistical significance at the 0.05 confidence level.

(Standard errors are shown in parentheses)

TABLE C.6 DIFFERENCE BETWEEN ACTUAL AND EXPECTED UTILIZATION
FOR OTITIS MEDIA PATIENTS AS A FUNCTION OF PRACTICE TYPE AND
ORGANIZATIONAL CHARACTERISTICS

INDEPENDENT VARIABLES -----	OFFICE VISITS (SUOV)	AMBULATORY CARE (SUAC)
PRACTICE TYPE -----		
IPA	0.1951 (0.1706)	0.2316 (0.1659)
FFS	0.1604 (0.1958)	0.2423 (0.1905)
INTERCEPT	-0.1095 (0.1217)	-0.1454 (0.1184)
ADJUSTED R2	-0.05	-0.13
DECISIONMAKING (DM) -----		
DM=0	-0.0493 (0.2183)	-0.0506 (0.2215)
DM=2	0.1251 (0.1900)	0.1312 (0.1928)
INTERCEPT	-0.0165 (0.0989)	-0.0201 (0.1003)
ADJUSTED R2	-0.13	-0.13
PEER INTERACTION/QUALITY ASSURANCE (PI/QA) -----		
PI/QA=0	0.3611 (0.2086)	0.3729* (0.2023)
PI/QA=1	-0.0334 (0.1686)	-0.0106 (0.1635)
PI/QA=2	-0.1221 (0.1867)	-0.1749 (0.1810)
INTERCEPT	-0.0139 (0.1189)	-0.0139 (0.1154)
ADJUSTED R2	0.15	0.23
UTILIZATION REVIEW (UR) -----		
UR=0	0.3611 (0.2086)	0.1430 (0.2472)
UR=1	0.1532 (0.2259)	0.1489 (0.2299)
INTERCEPT	-0.1075 (0.1992)	-0.1225 (0.2028)
ADJUSTED R2	-0.15	-0.15

TABLE 6 - OTITIS MEDIA (cont.)

INDEPENDENT VARIABLES	(SUOV)	(SUAC)

FINANCIAL INCENTIVES (FI)		

FI=0	0.0459 (0.2351)	-0.0022 (0.2460)
FI=1	-0.2006 (0.2369)	-0.1951 (0.2479)
FI=2	-0.0209 (0.2496)	0.0124 (0.2611)
INTERCEPT	0.0452 (0.1917)	0.0582 (0.2006)
ADJUSTED R2	-0.09	-0.16
PRACTICE TYPE AND DECISION MAKING		

IPA	0.1997 (0.1935)	0.2328 (0.1881)
FFS	0.1419 (0.2175)	0.2262 (0.2114)
DM=0	0.0029 (0.2504)	-0.0119 (0.2434)
DM=2	0.1359 (0.2053)	0.1300 (0.1995)
INTERCEPT	-0.1384 (0.1536)	-0.1698 (0.1493)
ADJUSTED R2	-0.24	-0.13
PRACTICE TYPE AND PEER INTERACTION/QUALITY ASSURANCE		

IPA	-0.0276 (0.4016)	-0.1216 (0.3696)
FFS	0.1184 (0.2618)	0.1443 (0.2409)
PI/QA=0	0.4479 (0.4032)	0.5667 (0.3709)
PI/QA=1	0.0172 (0.3226)	0.1172 (0.2968)
PI/QA=2	-0.0629 (0.0236)	-0.1028 (0.2241)
INTERCEPT	-0.0732 (0.1851)	-0.0861 (0.1704)
ADJUSTED R2	-0.03	0.16

TABLE 6 - OTITIS MEDIA (cont.)

INDEPENDENT VARIABLES -----	(SUOV)	(SUAC)
PRACTICE TYPE AND UTILIZATION REVIEW -----		
IPA	0.1576 (0.1993)	0.2022 (0.1949)
FFS	0.2531 (0.3357)	0.3079 (0.3284)
UR=0	-0.0230 (0.3689)	0.0034 (0.3609)
UR=1	0.1305 (0.2374)	0.1197 (0.2322)
INTERCEPT	-0.1792 (0.2266)	-0.2144 (0.2217)
ADJUSTED R2	-0.25	-0.15

PRACTICE TYPE AND FINANCIAL INCENTIVE -----		
IPA	0.2913 (0.2069)	0.3503 (0.2032)
FFS	0.2856 (0.3958)	0.5094 (0.3886)
FI=0	0.2543 (0.4385)	0.4142 (0.4305)
FI=1	-0.0661 (0.4242)	0.1326 (0.4165)
FI=2	0.0172 (0.3343)	0.1172 (0.3282)
INTERCEPT	-0.2404 (0.4398)	-0.4512 (0.4318)
ADJUSTED R2	-0.10	-0.03

* Indicates statistical significance at the 0.10 confidence level.

** Indicates statistical significance at the 0.05 confidence level.

Note: N = 13 for all otitis media regressions.

(Standard errors are shown in parentheses)

D. PEDIATRIC ASTHMA

Descriptive Analysis

Mean utilization values by site for pediatric asthma are shown in Table D.1 and standardized unit values are shown in Table D.2. Thirteen sites had 10 or more asthma patients during the T1 time period.

Office visits, prescribed medications, lab tests, x-rays, allergy skin tests, and desensitization injections show statistical significance at the 0.05 level. Among the standardized unit values, office visits, prescribed medications, total ambulatory care and special procedures show significance.

Office visits range from a low of 1.65 to a high of 5.52. One site - West IPA - has an unusually high value for office visits relative to all other sites. Without West IPA the mean values range from 1.65 to 3.50. This high value for West IPA is coupled with a high value of 4.10 for desensitization injections - which require the patient to make an additional office visit for each injection. The other site with a relatively high value for office visits of 3.50, Pacific IPA, also has a high value for injections.

Although injections are not considered by many clinicians to be a good clinical substitute for medications, West IPA has a very low value for medications (0.45) while the range for all other sites is 1.15 to 4.00. It is unclear from the data whether this low value is correct. West IPA has poor medications data for the other diagnoses, but because of the negative correlation with desensitization injections, the value for asthma medications appears to be correct. The correlation coefficient for individual patients within West IPA between medications and injections is -0.46. The correlation coefficient over all sites is -0.24. Both of these values are statistically significant at the 0.01 confidence level. For almost all patients, either some medication is prescribed or injections are given, with a few patients receiving both medication and injections. Two sites, West FFS and Central FFS, show values for allergy skin tests, but no values for injections. Generally, an injection would follow a positive skin test. At these two sites the patient was given medication, and in one case

no treatment was ordered, presumably because the test was negative. Only one other patient (at West IPA) had a skin test but received no follow-up treatment.

Patients are usually not admitted to the hospital for treatment of pediatric asthma. Differences among hospital admissions are not significant for either unstandardized or standardized unit values. Admissions range from 0.00 to 0.22, with 5 of the 13 sites having zero admissions.

Lab tests and x-rays are significant at the 0.05 level. Most patients generally have either the tests or x-rays and only a few of the cases have both. Almost all asthma patients are x-rayed at the time of initial diagnosis and some physicians are more likely to also order subsequent x-rays.

When the practice sites are grouped according to organizational variables (Table D.3), some changes occur in the significance of the variables being tested. Office visits, prescribed medications, and desensitization injections are significantly different across organizational types. Hospital admissions become significant for decision making, peer interaction/quality assurance, and utilization review. Lab tests show significant differences for geographic region and financial incentives. Lab profiles show a significant difference at the 0.10 level for centralization of decisionmaking. X-rays are significant for practice type, region, decisionmaking, and peer interaction/quality assurance. And finally, allergy skin tests are significant at the 0.10 level for geographic region.

Each of the organizational characteristic scores was set up so that a higher value (e.g. DM=2) indicates greater expected control of utilization. Thus, it is expected that with greater control, mean utilization values will be lower. While there are statistically significant differences among the groups of organizational characteristics, the pattern of values from low to high utilization is generally not as expected. For instance the ranking for office visits for utilization review is: UR=0 is low, UR=1 is high, and UR=2 is in the middle. The expected pattern is: UR=0 is high, UR=1 is in the middle, and UR=2 is low.

When standardized unit values are used (Table D.4), office visits are significant by different practice type, geographic region, degree of peer interaction/quality assurance, and type of financial incentives. Prescribed

medications are significantly different across all organizational factors. Total ambulatory care - which combines office visits, diagnostic procedures, lab tests, and x-rays - is significant by region, peer interaction/quality assurance, and financial incentives. Special procedures - which include *** allergy skin tests and desensitization injections - is significant for all organizational factors except centralization of decisionmaking and utilization review. Hospital admissions are significant for peer interaction/quality assurance and utilization review. Total utilization is significant only for region and peer interaction/quality assurance. When medications are subtracted from total utilization (because of uncertainty about the reliability of the data) this pattern remains.

The values for West IPA are driving the significance for all of the variables for peer interaction/quality assurance. When West IPA is excluded much of the difference disappears, only prescribed medications and hospital admissions continue to be significant.

Regression Analysis

In the first stage of the regression analysis for pediatric asthma, patient age and geographic region were regressed on SUOV, SUAC, SUADM and TSU. Patients were grouped according to age, with those under 5 years old falling into one group, and those 5 or older falling into the other group. (See Table D.5.)

Patient age was statistically significant for SUOV, SUAC, and SUADM. A younger patient tends to have lower utilization values for office visits and total ambulatory care, but higher hospital utilization. Geographic region was significant for SUOV, SUAC, and TSU. Practice sites in the West show the highest values for SUOV and SUAC, and the Atlantic region has the highest ranking for total utilization, including medications, in the second stage of the regression analysis.

The expected utilization for each site for each of the dependent variables was compared with actual utilization at each site and then tested against practice type and the other organizational characteristics. The results from these regressions are shown in Table D.6.

Although there is not a statistically significant difference across practice types for hospital admissions in the ANOVA test, PGPs report a substantially higher mean value for admissions (13.87) than either IPAs (mean = 9.18) or FFSs (mean = 4.11). At the same time PGPs report lower utilization for ambulatory care and special procedures, with a middle ranking for prescribed medications (Table D.4).

ANOVA test Ranking	Hospital Admissions	Ambulatory Care	Special Procedures	Prescribed Medications
High	PGP	FFS	IPA	FFS
Middle	IPA	IPA	FFS	PGP
Low	FFS	PGP	PGP	IPA

After controlling for geographic region and patient age, PGPs still show the highest ranking for hospital admissions, with FFS's ranking second and IPA's showing the lowest utilization.

Regression Test Ranking	Hospital Admissions	Ambulatory Care	Total Including Prescribed Medications
High	PGP	FFS	PGP
Middle	FFS	IPA	FFS
Low	IPA	PGP	IPA

These results indicate that PGPs may have more sickly patients, or that PGPs are more likely to treat their asthma patients with hospitalization than are the other two practice types. This result runs counter to the general belief that PGPs reduce their costs by reducing hospitalizations.

Although few significant differences appear when each of the organizational characteristics is tested against the dependent variables, when practice type is added to the model, there are significant differences for hospital admissions (SUADM) and total utilization including medications. (TSU) Table D.6.

When decisionmaking, peer interaction/quality assurance, and practice type are tested individually, there are no significant differences for TSU, and only a marginal significance for decisionmaking for SUADM. But, when decision making and peer interaction/quality assurance are each combined with practice type, each category of variables is significant.

TABLE D.1 PEDIATRIC ASTHMA -- MEAN UTILIZATION BY PRACTICE SITE

PRACTICE SITE	# OF PATIENTS	OFFICE VISITS	MEDICATIONS	HOSP. ADMITS	LAB TESTS	LAB PROFILES	X-RAYS	SKIN TESTS	DESENSE INJECTS.
IFIC PGP	18	1.94**	2.61**	0.11	0.50**	0.11	0.06**	0.00**	0.00**
IFIC IPA	20	3.50	2.90	0.00	0.00	0.00	0.05	0.20	1.20
IFIC FFS	25	2.76	2.88	0.08	0.40	0.28	0.28	0.00	0.68
T PGP	24	2.67	3.04	0.22	0.29	0.13	0.33	0.00	0.00
T IPA	29	5.52	0.45(b)	0.17	0.48	0.03	0.14	0.28	4.10
T FFS	17	2.53	3.59	0.00	0.94	0.12	0.35	0.41	0.00
WEST PGP	21	2.05	3.09	0.14	0.62	0.05	0.00	0.00	0.00
WEST IPA	16	2.19	2.44	0.07	0.81	0.06	0.13	0.00	0.25
WEST FFS	12	1.67	2.25	0.00	0.08	0.00	0.08	0.00	0.00
TRAL PGP	13	2.23	4.00	0.00	0.23	0.08	0.46	0.00	0.00
TRAL IPA	20	1.65	1.15	0.00	0.25	0.05	0.00	0.00	0.40
TRAL FFS	22	1.95	3.95	0.05	0.00	0.00	0.09	0.18	0.00
ANTIC PGP+	--	---	---	---	---	---	---	---	---
ANTIC IPA	18	1.72	(a)	0.17	0.11	0.06	0.06	0.00	0.50

TOTAL: 255

Differences among the sites are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all sites.

Differences among the sites are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all sites.

Under ten patient records were obtained for T1 at this site.

Prescribed medications data are low for West IPA and Atlantic Ipa because of coding errors and lack of medications data on claims form.

Despite the fact that West IPA is a claims data site and therefore has suspect medications data, these values are included in the analysis of pediatric asthma.

TABLE D.1.b
PERCENT DISTRIBUTION OF ASTHMA PATIENTS RECEIVING ALLERGY SKIN TESTS, MEDICATIONS
AND DESENSITIZATION INJECTIONS

PRACTICE SITE	SKIN TEST & NO TREATMENT	SKIN TEST & MEDS	SKIN TEST & INJECTIONS	SKIN TEST MEDS & INJECTIONS	MEDS ONLY	INJECTIONS ONLY	MEDS & INJECTIONS	NO TREATMENT
PACIFIC PGP	0	0	0	0	94%	0	0	6%
PACIFIC IPA	0	0	0	5%	85	0	10%	0
PACIFIC FFS	0	0	0	0	88	8%	4	0
WEST PGP	0	0	0	0	96	0	0	4
WEST IPA	3%	3%	3%	3	27	38	7	14
WEST FFS	6	18	0	0	76	0	0	0
MIDWEST PGP	0	0	0	0	95	0	0	5
MIDWEST IPA	0	0	0	0	94	0	6	0
MIDWEST FFS	0	0	0	0	100	0	0	0
CENTRAL PGP	0	0	0	0	100	0	0	0
CENTRAL IPA	0	0	0	0	65	0	0	35
CENTRAL FFS	0	18	0	0	82	0	0	0
ATLANTIC IPA+	--	--	--	--	--	--	--	--

+ Under 10 patient records were obtained for T1 at this site.

TABLE D.2 PEDIATRIC ASTHMA -- MEAN STANDARDIZED UTILIZATION BY PRACTICE SITE

PRACTICE SITE	NUMBER OF PATIENTS	OFFICE VISITS	MEDICATIONS	AMBULATORY CARE-TOTAL (c)	SPECIAL PROCEDURES	HOSPITAL ADMISSIONS	TOTAL W/MEDS (d)	TOTAL W/OUT MEDS (e)
IC PGP	18	1.88**	5.07**	3.24**	0.00**	11.86	19.86	14.79*
IC IPA	20	3.38	5.63	3.45	1.15	0.00	10.23	4.60
IC FFS	25	2.79	5.59	3.86	0.35	8.32	18.13	12.53
PGP	24	2.88	5.90	3.87	0.00	22.61	31.44	25.54
IPA	29	6.50	0.87(b)	7.42	2.87	17.93	29.09(b)	28.22
FFS	17	4.31	6.96	6.93	1.08	0.00	14.97	8.01
ST PGP	21	2.05	6.00	2.40	0.00	14.86	23.26	17.26
ST IPA	16	2.24	4.73	3.37	0.13	6.93	14.72	10.00
ST FFS	12	1.78	4.36	2.06	0.00	0.00	6.42	2.06
AL PGP	13	2.17	7.76	3.23	0.00	0.00	10.99	3.23
AL IPA	20	1.63	2.23	2.19	0.21	0.00	4.58	2.35
AL FFS	22	2.26	7.67	3.59	0.48	4.73	16.46	8.78
TIC PGP+	--	---	---	---	---	---	---	---
TIC IPA	18	2.23	(a)	2.39	0.26	17.33	(a)	19.99

TOTAL: 255

Differences among the sites are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all sites.

Differences among the sites are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all sites.

Under ten patient records were obtained for T1 at this site.

Prescribed medications data are low for West IPA and Atlantic IPA because of coding errors and lack of medications data on claims form.

Despite the fact that West IPA is a claims data site and therefore has suspect medications data, these values are included in the analysis of pediatric asthma.

Ambulatory care standardized units (SU) = (office visits SU + lab profile SU + lab test SU + X-rays SU + other procedures SU)

Total standardized units (SU) = (ambulatory care SU + prescribed medications SU + special procedures SU + hospital admissions SU)

Total standardized units without medications = (ambulatory care SU + special procedures SU + hospital admissions SU)

West IPA and Central IPA are included because only medications data is missing.

TABLE D.3 PEDIATRIC ASTHMA -- MEAN UTILIZATION BY PRACTICE TYPE, REGION,
AND ORGANIZATIONAL CHARACTERISTICS

	# OF PATIENTS	OFFICE VISITS	MEDI- CATIONS	HOSP. ADMITS	LAB TESTS	LAB PROFILES	X-RAYS	SKIN TESTS	DE-SENSE INJECTS.
PRACTICE TYPE									
P	76	2.25**	3.12**	0.13	0.42	0.09	0.20*	0.00	0.00**
A	103(f)	3.19	1.56	0.09	0.33	0.04	0.08	0.12	1.59
S	76	2.30	3.25	0.04	0.36	0.12	0.21	0.14	0.22
GEOGRAPHIC REGION									
PACIFIC	63	2.76**	2.81*	0.06	0.30**	0.14	0.14**	0.06*	0.65**
ST	70	3.81	2.10	0.14	0.53	0.09	0.26	0.21	1.70
OWEST	49	2.00	2.67	0.08	0.55	0.04	0.06	0.00	0.08
NTRAL	55	1.91	2.95	0.02	0.15	0.04	0.15	0.07	0.15
LANTIC	18(f)	1.72	(f)	0.17	0.11	0.06	0.06	0.00	0.50
DECISIONMAKING (DM)									
=0	42	2.19**	3.33**	0.00**	0.48	0.07*	0.31**	0.16	0.00**
=1	152	2.94	2.35	0.10	0.34	0.05	0.11	0.11	1.02
=2	61(f)	2.21	2.77	0.11	0.34	0.16	0.15	0.00	0.43
PAYER INTERACTION/QUALITY ASSURANCE (PI/QA)									
/QA=0	47(f)	4.06**	0.45**	0.17**	0.34	0.04	0.11**	0.17	2.72**
/QA=1	78	2.32	2.65	0.03	0.23	0.03	0.06	0.10	0.46
/QA=2	45	2.38	3.07	0.18	0.44	0.09	0.18	0.00	0.00
/QA=3	85	2.31	3.05	0.05	0.46	0.14	0.25	0.08	0.20
UTILIZATION REVIEW (UR)									
=0	94	2.23**	3.13**	0.05**	0.38	0.12	0.18	0.12	0.18**
=1	119	3.10	2.10	0.08	0.40	0.04	0.11	0.10	1.30
=2	42(f)	2.26	3.04	0.20	0.21	0.10	0.21	0.00	0.21
FINANCIAL INCENTIVES (FI)									
=-2	54(f)	2.44**	2.96*	0.04	0.50**	0.17	0.26	0.13	0.31**
=0	87	3.40	2.33	0.15	0.42	0.06	0.20	0.09	1.37
=1	54	2.59	2.66	0.06	0.40	0.06	0.07	0.07	0.51
=2	60(f)	1.78	2.61	0.06	0.17	0.03	0.05	0.06	0.28

Differences among the categories are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all categories.

Differences among the categories are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all categories.

West IPA and Atlantic IPA are missing medications data. Therefore, mean values for medications are calculated without these sites. The N of patients for medications is lower than indicated for categories which include these two sites.

TABLE D.4 PEDIATRIC ASTHMA -- MEAN STANDARDIZED UNITS BY PRACTICE TYPE, REGION, AND ORGANIZATIONAL CHARACTERISTICS

PRACTICE TYPE	NUMBER OF PATIENTS	OFFICE VISITS	MEDI-CATIONS	AMBULATORY CARE-TOTAL	SPECIAL PROCEDURES	HOSPITAL ADMISSIONS	TOTAL W/MEDS	TOTAL W/OUT MEDS
	76	2.29**	6.05**	3.21	0.00**	13.87	22.94	16.89
	103(f)	3.54	3.04(f)	4.12	1.14	9.18	16.17	14.34
	76	2.82	6.30	4.19	0.50	4.11	15.09	8.79
GRAPHIC REGION								
FIC	63	2.72**	5.45*	3.56**	0.51**	6.60	16.12**	10.67**
	70	4.73	4.07	6.08	1.45	15.07	26.47	22.39
EST	49	2.05	5.19	2.63	0.04	8.67	16.35	11.16
RAL	55	2.01	5.71	2.98	0.27	1.89	10.85	5.13
NTIC	18(f)	2.23	(f)	2.39	0.26	17.33	(f)	19.99
SIONMAKING (DM)								
	42	2.93	6.47**	4.39	0.44	0.00	11.29	4.83
	152	3.20	4.57	3.97	0.81	10.40	19.61	15.04
	61(f)	2.35	5.37	3.25	0.22	11.94	18.85	15.40
INTERACTION/QUALITY ASSURANCE (PI/QA)								
A=0	47(f)	4.87**	0.45**	5.49**	1.87**	17.70**	29.09**	25.06**
A=1	78	2.38	5.15	3.14	0.51	2.70	11.46	6.31
A=2	45	2.49	5.95	3.19	0.00	18.91	27.63	21.68
A=3	85	2.66	5.91	3.99	0.82	4.89	15.12	9.21
IZATION REVIEW (UR)								
	94	2.64	6.07**	4.00	0.40	5.53**	16.01	9.93
	119	3.33	4.08	3.98	0.94	7.93	16.86	12.79
	42(f)	2.60	5.90	3.24	0.11	20.29	31.49	23.16
ANCIAL INCENTIVES (FI)								
-2	54	3.04**	5.75*	4.43**	0.50**	3.85	14.53	5.74
	87	3.78	4.52	4.60	0.96	15.72	25.62	4.52
	54	2.54	5.36	3.35	0.46	5.88	14.77	5.17
	60(f)	2.04	5.38	2.74	0.32	6.93	13.55	5.08

Differences among the categories are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all categories.

Differences among the sites are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all categories.

West IPA and Atlantic IPA are missing all medications data. Therefore, mean values for medications are calculated without these sites. The N of patients for medications and total standard units with medications is lower than indicated for categories which include these two sites.

TABLE D.5 UTILIZATION OF SERVICES FOR PEDIATRIC ASTHMA PATIENTS
AS A FUNCTION OF PATIENT AGE AND PRACTICE GEOGRAPHIC REGION

	OFFICE VISITS (SUOV)	AMBULATORY CARE (SUAC)	HOSPITAL ADMISSIONS (SUADM)	TOTAL UTILIZATION (WITH MEDS) (TSUMD)
LT 5	-0.9057** (0.3274)	-1.0294** (0.4553)	7.3688* (4.2932)	2.7922 (4.2451)
FIC	0.8341* (0.4888)	1.1005 (0.6798)	-3.4673 (6.4104)	-0.7291 (6.1049)
	2.7563** (0.4757)	3.5370** (0.6616)	6.1928 (6.2386)	10.0406* (5.9254)
TRAL	0.0038 (0.5001)	0.3746 (0.6955)	-7.1336 (6.5582)	-5.6009 (6.2501)
ANTIC	0.2789 (0.7004)	-0.1442 (0.9740)	7.8487 (9.1844)	--
IRCEPT	2.3558** (0.3812)	2.9944** (0.5302)	6.2112 (4.9994)	15.3830** (4.7766)
JUSTED R2	0.19	0.16	0.04	0.02
	253	253	253	237

Indicates statistical significance at the 0.10 confidence level.

Indicates statistical significance at the 0.05 confidence level.

NOTE: Total utilization with meds does not include observations from Atlantic IPA due to missing data for medications.

(Standard errors are shown in parentheses)

TABLE D.6 DIFFERENCE BETWEEN ACTUAL AND EXPECTED UTILIZATION
FOR PEDIATRIC ASTHMA PATIENTS AS A FUNCTION OF PRACTICE TYPE AND
ORGANIZATIONAL CHARACTERISTICS

INDEPENDENT VARIABLES -----	OFFICE VISITS (SUOV)	AMBULATORY CARE (SUAC)	HOSPITAL ADMISSIONS (SUADM)	TOTAL UTILIZATION (WITH MEDS) (TSU)(a)
PRACTICE TYPE -----				
IPA	0.3033** (0.1362)	0.18454 (0.13414)	-0.7053 (0.5365)	-0.4329 (0.2442)
FFS	0.1819 (0.1461)	0.22513 (0.14389)	-0.2664 (0.5775)	-0.2325 (0.2509)
INTERCEPT	-0.1788 (0.1033)	-0.14429 (0.1017)	0.3368 (0.4070)	0.2288 (0.1774)
ADJUSTED R ²	0.20	0.07	-0.02	0.09
DECISION MAKING (DM) -----				
DM=0	-0.0878 (0.1859)	0.0302 (0.1750)	-1.0921* (0.5467)	-0.3954 (0.2745)
DM=2	-0.1246 (0.1616)	0.0193 (0.1521)	0.2521 (0.4753)	0.1264 (0.2720)
INTERCEPT	-0.0421 (0.0865)	-0.0122 (0.0814)	0.0921 (0.2544)	0.0461 (0.1277)
ADJUSTED R ²	-0.12	-0.20	0.21	0.06
PEER INTERACTION/QUALITY ASSURANCE (PI/QA) -----				
PI/QA=0	0.2899 (0.1609)	0.1016 (0.1572)	0.3965 (0.6794)	0.1955 (0.3652)
PI/QA=1	0.1601 (0.1388)	0.0308 (0.1356)	0.0258 (0.5861)	-0.0351 (0.2663)
PI/QA=2	-0.1293 (0.1632)	-0.2534 (0.1595)	0.7857 (0.6891)	0.3787 (0.3131)
INTERCEPT	-0.0817 (0.0960)	0.0139 (0.0938)	-0.2471 (0.4054)	-0.0854 (0.1842)
ADJUSTED R ²	0.23	0.11	-0.13	-0.09
UTILIZATION REVIEW (UR) -----				
UR=0	0.1577 (0.1687)	0.2482 (0.1672)	0.0259 (0.6777)	-0.1246 (0.4008)
UR=1	0.3322* (0.1631)	0.2289 (0.1617)	-0.4732 (0.6554)	-0.2364 (0.3921)
INTERCEPT	-0.2153 (0.1402)	-0.2009 (0.1390)	0.1838 (0.5635)	0.1670 (0.3577)
ADJUSTED R ²	0.18	0.04	-0.08	-0.16

TABLE D.6 - ASTHMA (cont.)

INDEPENDENT VARIABLES	(SUOV)	(SUAC)	(SUADM)	(TSUMD)
FINANCIAL INCENTIVES (FI)				
FI=0	0.0740 (0.1562)	-0.0694 (0.1799)	0.6240 (0.6651)	0.3829 (0.2766)
FI=1	0.0754 (0.2209)	-0.0307 (0.1999)	0.2175 (0.7389)	0.1151 (0.3073)
FI=2	0.0312 (0.2154)	0.0464 (0.1948)	0.5427 (0.7202)	0.2096 (0.2995)
INTERCEPT	-0.0528 (0.1562)	0.0254 (0.1414)	-0.4141 (0.5225)	-0.2141 (0.2173)
ADJUSTED R2	-0.30	-0.28	-0.19	-0.07

PRACTICE TYPE AND DECISION MAKING

IPA	-0.00682 (0.3332)	0.1876* (0.1547)	-0.9987** (0.3667)	-0.5919** (0.2072)
FFS	0.1980 (0.1664)	0.2212 (0.1679)	0.0955 (0.3981)	-0.0719 (0.2050)
DM=0	-0.0329 (0.1956)	0.0144 (0.1975)	-1.7028** (0.4680)	-0.6868** (0.2474)
DM=2	-0.1001 (0.1533)	0.0102 (0.1571)	-0.0371 (0.3723)	-0.1729 (0.2400)
INTERCEPT	-0.1495 (0.1266)	-0.1492 (0.1278)	0.6369* (0.3029)	0.3872** (0.1613)
ADJUSTED R2	0.05	-0.017	0.55	0.46

PRACTICE TYPE AND PEER INTERACTION/QUALITY ASSURANCE

IPA	-0.00682 (0.3332)	-0.2081 (0.3076)	-2.5210** (0.9415)	-1.2208** (0.4053)
FFS	0.0793 (0.2223)	0.0316 (0.2052)	-0.4580 (0.6281)	-0.3468 (0.2704)
PI/QA=0	0.3472 (0.3168)	0.3298 (0.2925)	2.6266** (0.8951)	1.1960** (0.4092)
PI/QA=1	0.1930 (0.2495)	0.1913 (0.2304)	1.6740** (0.7050)	0.7189** (0.3035)
PI/QA=2	-0.0789 (0.2303)	-0.2333 (0.2126)	0.4948 (0.6506)	0.1584 (0.2800)
INTERCEPT	-0.1321 (0.1772)	-0.00615 (0.1634)	0.0439 (0.5007)	0.1349 (0.2155)
ADJUSTED R2	0.04	0.02	0.37	0.45

Table D.6 - Asthma (cont.)

INDEPENDENT VARIABLES -----	(SUOV)	(SUAC)	(SUADM)	(TSUMD)
PRACTICE TYPE AND UTILIZATION REVIEW -----				
IPA	0.1953 (0.1407)	0.1558 (0.1571)	-0.4821 (0.6521)	-0.4718 (0.3547)
FFS	0.3168 (0.2169)	0.1757 (0.2421)	-0.7274 (1.0051)	-0.2413 (0.4581)
UR=0	-0.0148 (0.2408)	0.1729 (0.2688)	0.4074 (1.1157)	0.0705 (0.5449)
UR=1	0.2764 (0.1539)	0.1844 (0.1718)	-0.3354 (0.7139)	0.1006 (0.4659)
INTERCEPT	-0.2989* (0.1412)	-0.2677 (0.1576)	0.3904 (0.6543)	0.1670 (0.3568)
ADJUSTED R2	0.32	-0.01	-0.19	-0.16
PRACTICE TYPE AND FINANCIAL INCENTIVE -----				
IPA	0.4917** (0.1241)	0.3008* (0.1496)	-0.5413 (0.6003)	-0.2557 (0.2361)
FFS	0.7472** (0.2237)	0.6762** (0.2697)	1.2447 (1.0820)	0.5332 (0.4255)
FI=0	0.6573** (0.2366)	0.5065 (0.2853)	2.0493 (1.1443)	1.0014* (0.4500)
FI=1	0.5049* (0.2329)	0.5065 (0.2808)	1.8232 (1.1263)	0.8189 (0.4429)
FI=2	0.4930 (0.1757)	0.1913 (0.2119)	1.6740* (0.8499)	0.7093* (0.3342)
INTERCEPT	-0.8001** (0.2429)	-0.6508* (0.2928)	-1.6589 (1.1747)	-0.7473 (0.4620)
ADJUSTED R2	0.17	0.52	0.09	0.26

* Indicates statistical significance at the 0.10 confidence level.

** Indicates statistical significance at the 0.05 confidence level.

(Standard errors are shown in parentheses)

Note: N = 13 for SUOV, SUAC, and SUADM regressions, N = 12 for TSU.
Because of missing medications data, Atlantic IPA is excluded from TSU.

(a) Total utilization with meds does not include observations

E. UTERINE BLEEDING

Descriptive Analysis

The usual modes of treatment for uterine bleeding are to wait and observe patients, to perform a dilation and curettage (D&C), and rarely, to perform a hysterectomy. The practices studied here varied both in terms of the frequency and location, office versus hospital, of these procedures.

Mean utilization per patient by practice site is shown in Table E.1 for those sites where over 10 patient records were available for analysis for the two-month T1 time period. Except for mean hysterectomy rates, differences in utilization among the 12 sites are statistically significant at a 0.05 level. With the exception of Central FFS, where the average number of visits was 2.25, patients visited the office on average from 1.08 to 2.00 times (Table E.1). Those patients who also received a hysterectomy or D&C, usually had more than one office visit. The majority of patients are not admitted to the hospital and receive neither a hysterectomy nor a D&C (Table E.1.b). Rather, most patients are observed or treated only with a prescribed medication. The two-month period studied may not be long enough to measure a hysterectomy because many women are observed for far longer before a procedure is performed. For those women who may initially have a D&C, a later hysterectomy may be done if uterine bleeding persists after a longer waiting period than two months. Laboratory tests and laboratory profiles in the ambulatory setting are not more common for patients who also have procedures. This may imply that the test often is used to rule out the need for a procedure or that the tests were done on an inpatient basis. Not surprisingly, even those patients on whom procedures were performed seldom were x-rayed in the ambulatory setting.

Seven of the 13 sites perform D&Cs both on an inpatient and on an outpatient basis. For example, at West FFS, one patient received a D&C and a hospital admission and one patient received a D&C and no admission.² At two sites in the Central region, all procedures were done on an inpatient

2. It is not possible to link the procedure and the hospital admission using the data that were collected. Thus, it is known that a patient received a D&C and that the patient was hospitalized. However, it is not certain that the D&C was performed during that hospitalization.

basis. At Central FFS, all 11 patients who received D&Cs and hysterectomies were also admitted. Although Central IPA did far fewer procedures, the two patients who received D&Cs both were admitted. In fact, at Central PGP, 5 out of 6 D&Cs also were done on an inpatient basis. Thus, the differences across sites may reflect a regional style of medical practice across all types of practice arrangements. Finally, at Atlantic PGP, all three D&Cs were done outside the hospital (Table E.1.b).

Table E.2 shows mean standardized units (SUs) for uterine bleeding. The SU value is 20.4 for a D&C, 75.5 for a hysterectomy, and 224.7 for a hospital admission. Thus, a site where procedures are performed more often in the hospital will have much higher average total utilization standardized units. This is seen in the last column of Table E.2 for Central FFS where the total is three times the next highest site. This discrepancy is explained both by the higher rate of procedures among patients at this site and by the fact that all procedures are performed on patients who also are hospitalized.

Tables E.3 and E.4 show the data by practice type, geographic region, and organizational characteristics. The high values at Central FFS make many of the categories into which this site falls also have the highest values. Thus, high values are frequently found for the FFS practice type, Central region, decision-making=0, peer interaction/quality assurance=1, utilization review=0, and financial incentives=2. The differences among categories are especially large for hospital admissions and D&C on Table E.3 as well as standardized utilization of special procedures, hospital admissions, and total utilization on Table E.4.

One way to examine Tables E.3 and E.4 is to look for differences across categories not accounted for by the outlier, Central FFS. When Central FFS is disregarded, relatively few differences emerge. For example, the practice types PGP and IPA are similar across all measures. In fact, even with Central FFS included, differences among utilization review categories are only significant for lab tests and total ambulatory care, depending upon whether counts or standardized utilization is examined.

Regression Analysis

In the first stage of the regression analysis for uterine bleeding, expected utilization of standardized units for office visits, ambulatory care, hospital admissions, and total utilization were expressed as a function of patient age and geographic region for all 281 patients (Table E.5). Patients under age 30 show significantly lower hospital admissions and total admissions. Geographic region was significant for all four utilization measures. Compared to the patients in the Midwest region, patients in the Pacific, West, Central, and Atlantic regions all showed higher utilization of office visits. The Atlantic region was significantly lower than the Midwest in terms of hospital admissions, while the Central region was higher in terms of total utilization.

In the second stage of the regression analysis, the ratio of expected to actual utilization for each measure of utilization is aggregated over all patients at each site. These site specific variables are tested against practice type and the organizational categories to see if controlling for patient age and geographic region changes the results shown on Table E.4. These regression results are shown in Table E.6.

Comparisons of Tables E.4 and E.6 show that in some instances controlling for patient age and region changes the significance of the results. For example, the standardized units for ambulatory care, hospital admissions, and total utilization are all highest for the FFS practice on Table E.4. However, after controlling for region and patient age, the differences among practice type are no longer significant (Table E.6). This confirms the idea that there may indeed be a regional style of practice for uterine bleeding.

Similar results are seen for the organizational characteristics variables. While standardized office visit utilization is significantly higher for decisionmaking=2 on Table 4, there are no significant differences on Table 6. Significant differences among levels of peer interaction/quality assurance for ambulatory care, hospital admissions, and total utilization disappear when patient age and region are controlled for, but remain when practice type also is controlled for. In fact, for both hospital admissions and total utilization, even controlling for patient age,

region and practice type, $PI/QA=0$ and $PI/QA=1$ show higher utilization than $PI/QA=2$ or $PI/QA=3$. This result is opposite the expectation that with more peer interaction and formal quality assurance, as PI/QA is higher, utilization will be lower.

Like PI/QA , financial incentives which are significantly different in Table E.4 for ambulatory care, hospital admissions and total utilization, also are significantly different on Table E.6. This supports the notion that when practice type as well as age and region are controlled, differences in utilization may be attributed to financial incentives.

TABLE E.1 UTERINE BLEEDING -- MEAN UTILIZATION BY PRACTICE SITE

ICE	# OF PATIENTS	OFFICE VISITS	MEDI-CATIONS	HOSP. ADMITS	LAB TESTS	LAB PROFILES	X-RAYS	HYSTER-ECTOMY	D & C
IC PGP	25	1.72**	0.52**	0.04**	1.60**	0.52**	0.04**	0.00	0.12**
IC IPA	27	1.70	0.81	0.07	1.22	0.67	0.15	0.04	0.15
IC FFS	26	1.65	0.62	0.04	0.88	0.42	0.12	0.04	0.04
PGP	21	1.62	0.90	0.05	0.48	0.14	0.05	0.05	0.05
IPA	26	1.50	(a)	0.12	0.85	0.23	0.00	0.08	0.23
FFS	10	1.50	0.00	0.10	1.30	0.20	0.10	0.00	0.20
ST PGP	22	1.36	0.59	0.14	0.27	0.14	0.00	0.00	0.14
ST IPA	11	1.64	0.82	0.18	0.82	0.36	0.09	0.09	0.18
ST FFS	24	1.08	0.50	0.13	1.58	0.04	0.04	0.00	0.17
RAL PGP	24	1.63	1.08	0.21	2.00	0.17	0.17	0.00	0.25
RAL IPA	27	1.85	(a)	0.07	0.96	0.22	0.04	0.00	0.07
RAL FFS	28	2.25	1.10	0.61	1.43	0.25	0.18	0.07	0.46
NTIC PGP	11	2.00	0.72	0.00	3.64	0.82	0.18	0.00	0.27
NTIC IPA+	--	---	---	---	---	---	---	---	---

TOTAL: 282

Differences among the sites are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all sites.

Differences among the sites are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all sites.

Under ten patient records were obtained for T1 at this site.

Prescribed medication data are omitted for West IPA and Central IPA because of coding errors and lack of medication data on claims forms.

TABLE E.1.b PERCENTAGE OF PATIENTS ADMITTED AND RECEIVING PROCEDURES
FOR UTERINE BLEEDING

CE	# OF PATIENTS	NO HOSPITAL ADMIT & NO PROCEDURES	HOSPITAL ADMIT & NO PROCEDURES	D&C AND NO HOSPITAL ADMIT	D&C AND HOSPITAL ADMIT	HYSTERECTOMY & HOSPITAL ADMIT	HYSTERECTOMY AND D&C AND HOSP. ADMIT
IC PGP	25	88.5%	---	7.7%	3.8%	---	---
IC IPA	27	81.5	---	11.1	3.7	3.7%	---
IC FFS	26	92.3	---	3.8	---	3.8	---
PGP	21	90.5	---	4.8	---	4.8	---
IPA	26	69.4	3.8%	19.2	---	3.8	3.8%
FFS	10	80.0	---	10.0	10.0	---	---
ST PGP	22	77.3	9.0	9.0	4.5	---	---
ST IPA	11	81.8	---	9.1	9.1	---	---
ST FFS	24	83.3	---	4.2	12.5	---	---
RAL PGP	24	75.0	---	4.2	20.8	---	---
RAL IPA	27	92.6	---	---	7.4	---	---
RAL FFS	28	50.0	3.6	---	42.9	---	3.6
NTIC PGP	11	72.7	---	27.3	---	---	---
NTIC IPA+	--	---	---	---	---	---	---

Under ten patient records were obtained for T1 at this site.

TABLE E.2 UTERINE BLEEDING -- MEAN STANDARDIZED UTILIZATION BY PRACTICE SITE

DE	NUMBER OF PATIENTS	OFFICE VISITS	MEDI-CATIONS	AMBULATORY CARE-TOTAL (c)	SPECIAL PROCEDURES	HOSPITAL ADMISSIONS	TOTAL W/MEDS (d)	TOTAL W/OUT MEDS (e)
C PGP	25	2.25	2.54**	4.53**	2.44*	8.99**	18.50**	15.96**
C IPA	27	1.95	3.98	4.06	5.81	16.64	30.49	26.52
C FFS	26	2.45	3.00	4.80	3.69	8.64	20.13	17.13
GP	21	1.98	4.42	2.80	4.56	10.69	22.48	18.06
PA	26	2.26	(b)	3.09	10.51	25.92	(b)	39.52
FS	10	1.95	0.00	3.05	4.07	22.47	29.59	29.59
T PGP	22	1.65	2.88	2.02	2.78	30.64	38.32	35.43
T IPA	11	2.05	3.99	2.83	10.56	40.85	58.24	54.25
T FFS	24	1.34	2.44	2.56	3.39	28.08	36.48	34.04
AL PGP	24	1.95	5.29	5.31	5.09	46.81	62.50	57.21
AL IPA	27	1.80	(b)	3.06	1.51	16.64	(b)	21.21
AL FFS	28	2.56	5.40	7.12	14.85	136.41	163.78	158.38
IC PGP	11	2.97	3.55	7.83	5.55	0.00	16.93	13.39
IC IPA	--	---	---	---	---	---	---	---

TOTAL: 282

Differences among the sites are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all sites.

Differences among the sites are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all sites.

Under 10 patient records were obtained for T1 at this site.

Standardized unit values are missing because of missing raw data. See Table 1 for details.

Ambulatory care standardized units (SU) = (office visits SU + lab profile SU + X-rays SU + other procedures SU)

Total standardized units (SU) = (ambulatory care SU + prescribed medications SU + special procedures SU + hospital admissions SU)

Total standardized units without medications = (ambulatory care SU + special procedures SU + hospital admissions SU)

West IPA and Central IPA are included because only medications data is missing.

TABLE E.3 UTERINE BLEEDING -- MEAN UTILIZATION BY PRACTICE TYPE, REGION,
AND ORGANIZATIONAL CHARACTERISTICS

PRACTICE SITE	# OF PATIENTS	OFFICE VISITS	MEDI-CATIONS	HOSP. ADMITS	LAB TESTS	LAB PROFILES	X-RAYS	HYSTER-ECTOMY	D&C
	103	1.62	0.77	0.10**	1.40	0.31	0.08	0.01	0.16
	91(f)	1.68	0.82	0.10	0.99	0.37	0.07	0.04	0.15
	88	1.67	0.67	0.25	1.30	0.24	0.11	0.03	0.23
REGION									
FIC	78	1.68**	0.65**	0.65**	1.23**	0.54**	0.10	0.03	0.10*
	57(f)	1.54	0.61	0.09	0.79	0.19	0.04	0.05	0.16
EST	57	1.30	0.60	0.14	0.93	0.14	0.04	0.02	0.16
RAL	79(f)	1.92	1.09	0.30	1.44	0.22	0.13	0.03	0.27
NTIC	11	2.00	0.73	0.00	3.64	0.82	0.18	0.00	0.27
SIONMAKING (DM)									
	58	1.38**	0.65	0.16	1.71**	0.12**	0.10	0.00	0.21
	173(f)	1.75	0.85	0.17	1.08	0.32	0.08	0.04	0.20
	51	1.67	0.57	0.04	1.24	0.47	0.08	0.02	0.08
INTERACTION/QUALITY ASSURANCE (PI/QA)									
QA=0	26(f)	1.50**	---	0.12**	0.85*	0.23	0.00	0.08	0.23
QA=1	93(f)	1.90	0.94	0.25	1.16	0.38	0.12	0.04	0.23
QA=2	54	1.59	0.74	0.07	1.04	0.28	0.06	0.02	0.13
QA=3	109	1.51	0.61	0.10	1.49	0.28	0.09	0.01	0.15
IZATION REVIEW (UR)									
0	113	1.67	0.64	0.20	1.36*	0.30	0.10	0.03	0.20
-	148(f)	1.65	0.82	0.11	1.24	0.34	0.08	0.03	0.18
2	21	1.62	0.90	0.05	0.48	0.14	0.05	0.05	0.05
ANCIAL INCENTIVES (FI)									
-2	60	1.40**	0.46**	0.08**	1.23**	0.23**	0.08	0.02	0.12
0	93(f)	1.52	0.62	0.13	0.92	0.17	0.05	0.03	0.17
1	74	1.75	0.70	0.06	1.64	0.63	0.11	0.03	0.16
2	55(f)	2.05	1.12	0.34	1.20	0.23	0.11	0.04	0.27

Differences among the categories are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all categories.

Differences among the categories are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all categories.

West IPA and Central IPA are missing all medications data. Therefore, the N of patients for medications and total standard units with medications is lower than indicated for categories which include these sites.

TABLE E.4 UTERINE BLEEDING -- MEAN STANDARDIZED UNITS BY PRACTICE TYPE, REGION, AND ORGANIZATIONAL CHARACTERISTICS

PRACTICE TYPE -----	NUMBER OF PATIENTS	OFFICE VISITS	MEDI- CATIONS	AMBULATORY CARE-TOTAL	SPECIAL PROCEDURES	HOSPITAL ADMISSIONS	TOTAL W/MEDS	TOTAL W/OUT MEDS
	103	2.07	3.74	4.18*	3.90	21.81**	33.63**	29.88**
	91(f)	2.00	3.98	3.34	6.45	22.22	35.33	32.01
	88	2.13	3.27	4.73	7.20	56.17	71.37	68.10
GRAPHIC REGION -----								
IFIC	78	2.21**	3.19**	4.46**	4.02	11.52**	23.19**	20.00**
	57(f)	2.10	2.99	2.98	7.19	19.71	24.77	29.87
IST	57	1.60	2.91	2.40	4.54	31.53	41.39	38.48
RAL	79(f)	2.12	5.34	5.18	7.33	68.25	117.03	80.76
NTIC	11	2.97	3.55	7.85	5.56	0.00	16.93	13.39
SIONMAKING (DM) -----								
	58	1.70**	3.20	3.78	4.21	34.86	46.06	42.86
	173(f)	2.11	4.15	4.00	7.06	38.96	62.93	50.02
	51	2.35	2.77	4.67	3.08	8.81	19.33	16.55
INTERACTION/QUALITY ASSURANCE (PI/QA) -----								
A=0	26(f)	2.26	---	3.09**	10.51*	25.92**	---	39.52**
A=1	93(f)	2.10	4.58	4.55	7.85	55.56	91.66**	67.96
A=2	54	2.05	3.61	3.51	4.04	16.64	27.80	24.19
A=3	109	2.00	3.00	4.20	3.68	22.67	33.55	30.55
IZATION REVIEW (UR) -----								
	113	2.15	3.11	4.68*	6.15	45.73	59.67	56.56
	148(f)	2.02	4.01	3.80	5.62	25.81	42.03	35.22
	21	1.98	4.42	2.80	4.56	10.70	22.48	18.06
NCIAL INCENTIVES (FI) -----								
2	60	1.92	2.28**	3.61*	3.63	18.72**	28.25**	25.97**
	93(f)	1.98	3.04	3.34	5.94	28.98	41.31	38.27
	74	2.21	3.42	4.59	5.34	15.18	28.54	25.12
	55(f)	2.18	5.50	5.12	8.29	77.61	96.54	91.04

Differences among the categories are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all categories.

Differences among the categories are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all categories.

West IPA and Central IPA are missing all medications data. Therefore, the N of patients for medications and total standard units with medications is lower than indicated for categories which include these sites.

TABLE E.5 UTILIZATION OF SERVICES FOR UTERINE BLEEDING PATIENTS
AS A FUNCTION OF PATIENT AGE AND PRACTICE GEOGRAPHIC REGION

	OFFICE VISITS (SUOV)	AMBULATORY CARE (SUAC)	HOSPITAL ADMISSIONS (SUADM)	TOTAL UTILIZATION (WITHOUT MEDS) (TSU)
AGE GT 45	-0.0421 (0.2581)	0.7767 (0.8532)	4.6389 (19.3572)	6.1456 (22.0000)
AGE LT 30	-0.1148 (0.1517)	0.1911 (0.5017)	-23.6858** (11.3817)	-29.2379** (12.9356)
PACIFIC	0.6215** (0.2068)	2.0445** (0.6839)	-19.1093 (15.5165)	-17.3616 (17.6349)
WEST	0.5066** (0.2224)	0.5482 (0.7355)	-12.4029 (16.6857)	-9.3337 (18.9638)
CENTRAL	0.5445** (0.2089)	2.7458* (0.6906)	42.0728 (15.6687)	48.8967** (17.8079)
ATLANTIC	1.3894** (0.3917)	5.4712* (1.2948)	-28.2545** (29.3736)	-21.0074 (38.3839)
INTERCEPT	1.6378** (0.1684)	2.2712** (0.5568)	39.0208** (12.6316)	47.6832** (14.3561)
ADJUSTED R ²	0.04	0.09	0.06	0.06
N	281	281	281	281

*Indicates statistical significance at the 0.10 confidence level.

**Indicates statistical significance at the 0.05 confidence level.

(Standard errors are shown in parentheses)

TABLE E.6 DIFFERENCE BETWEEN ACTUAL AND EXPECTED UTILIZATION
FOR UTERINE BLEEDING PATIENTS AS A FUNCTION OF PRACTICE TYPE AND
ORGANIZATIONAL CHARACTERISTICS

INDEPENDENT VARIABLES -----	OFFICE VISITS (SUOV)	AMBULATORY CARE (SUAC)	HOSPITAL ADMISSIONS (SUADM)	TOTAL UTILIZATION (WITHOUT MEDS) (TSU)
PRACTICE TYPE -----				
IPA	-0.0091 (0.0924)	-0.0871 (0.1157)	0.1319 (0.3248)	0.0707 (0.2876)
FFS	0.0681 (0.0932)	0.1931 (0.1168)	0.5428 (0.3277)	0.4522 (0.2901)
INTERCEPT	-0.0183 (0.0633)	-0.0316 (0.0792)	-0.2443 (0.2224)	0.4522 (0.2901)
ADJUSTED	-0.11	0.24	0.07	0.06
DECISION MAKING (DM) -----				
DM=0	-0.1272 (0.0892)	0.0777 (0.1495)	-0.1171 (0.3859)	-0.1985 (0.3361)
DM=2	0.0515 (0.0937)	0.0853 (0.1570)	0.0846 (0.4052)	-0.0172 (0.3529)
INTERCEPT	0.0168 (0.0447)	-0.0309 (0.0749)	-0.0236 (0.1934)	0.0464 (0.1684)
ADJUSTED	0.06	-0.15	-0.18	-0.16
PEER INTERACTION/QUALITY ASSURANCE (PI/QA) -----				
PI/QA =0	0.1015 (0.1491)	-0.0127 (0.2229)	0.4139 (0.5280)	0.4329 (0.4814)
PI/QA=1	0.0428 (0.0964)	-0.0665 (0.1442)	0.1359 (0.3415)	0.1673 (0.3113)
PI/QA=2	0.0169 (0.1136)	-0.1397 (0.1699)	-0.3606 (0.4026)	-0.1323 (0.3670)
INTERCEPT	-0.0267 (0.0654)	0.0503 (0.0978)	-0.0463 (0.2317)	-0.0673 (0.2112)
ADJUSTED	-0.2577	-0.23	-0.07	-0.15
UTILIZATION REVIEW (UR) -----				
UR=0	0.0996 (0.1515)	0.1842 (0.1973)	0.7148 (0.5164)	0.6199 (0.4697)
UR=1	0.0300 (0.1487)	-0.0391 (0.1936)	0.2343 (0.5067)	0.2576 (0.4609)
INTERCEPT	-0.0557 (0.1392)	-0.5276 (0.1812)	-0.4417 (0.4742)	-0.3811 (0.4314)
ADJUSTED	0.09	0.19	0.14	0.08

TABLE 6 - UTERINE BLEEDING (cont.)

INDEPENDENT VARIABLES	(SUOV)	(SUAC)	(SUADM)	(TSU)
FINANCIAL INCENTIVES (FI)				
FI=0	-0.0968 (0.1727)	0.0202 (0.1149)	-0.0679 (0.4406)	-0.0669 (0.3859)
FI=1	-0.0650 (0.1812)	0.0277 (0.1206)	-0.0429 (0.4617)	0.0715 (0.4049)
FI=2	-0.0817 (0.1947)	0.0613 (0.1295)	0.1721 (0.4962)	0.1561 (0.4351)
INTERCEPT	0.0654 (0.1346)	-0.0259 (0.0896)	-0.0308 (0.3431)	-0.0247 (0.3009)
ADJUSTED R2	-0.29	-0.28	-0.28	-0.28
PRACTICE TYPE AND DECISION MAKING				
IPA	-0.0594 (0.0920)	-0.1149 (0.1424)	0.0191 (0.3874)	-0.1050 (0.3222)
FFS	0.0997 (0.0852)	0.2064 (0.1319)	0.6047 (0.3588)	0.5400 (0.2985)
DM=0	-0.2007* (0.1006)	-0.0703 (0.1557)	-0.3637 (0.4234)	-0.4829 (0.3522)
DM=2	-0.0144 (0.1032)	-0.0469 (0.1598)	-0.1157 (0.4347)	-0.2604 (0.3616)
INTERCEPT	0.0319 (0.0696)	-0.0038 (0.1079)	-0.1315 (0.2934)	0.0142 (0.2240)
ADJUSTED R2	0.11	0.07	-0.06	0.05
PRACTICE TYPE AND PEER INTERACTION/QUALITY ASSURANCE				
IPA	-0.2786 (0.1829)	-0.5152** (0.0289)	-1.2743** (0.4909)	-1.1452** (0.4115)
FFS	0.0018 (0.1186)	0.0335 (0.1354)	0.0344 (0.3183)	0.0948 (0.2668)
PI/QA=0	0.3811* (0.2008)	0.5210* (0.2293)	1.7072** (0.5388)	1.6302** (0.4517)
PI/QA=1	0.2380 (0.1410)	0.3019 (0.1610)	1.0351** (0.3784)	0.9913** (0.3172)
PI/QA=2	0.0179 (0.1215)	-0.1212 (0.1388)	-0.3416 (0.3262)	-0.0801 (0.2734)
INTERCEPT	-0.0277 (0.0880)	0.0319 (0.1005)	-0.0652 (0.2362)	-0.1194 (0.1979)
ADJUSTED R2	-0.02	0.41	0.50	0.55

TABLE 6 - UTERINE BLEEDING (cont.)

INDEPENDENT VARIABLES -----	(SUOV)	(SUAC)	(SUADM)	(TSU)
PRACTICE TYPE AND UTILIZATION REVIEW -----				
IPA	-0.0046 (0.1202)	-0.0698 (0.1507)	0.2467 (0.3999)	0.0851 (0.3669)
FFS	0.0264 (0.1613)	0.1359 (0.2002)	0.1152 (0.5365)	0.2350 (0.4923)
UR=0	0.0790 (0.2107)	0.0783 (0.2640)	0.6250 (0.7007)	0.4368 (0.6429)
UR=1	0.0328 (0.1817)	0.0038 (0.2277)	0.0826 (0.6043)	0.2053 (0.5545)
INTERCEPT	-0.0557 (0.1553)	-0.0527 (0.1947)	-0.4417 (0.5166)	-0.3811 (0.6429)
ADJUSTED R2	-0.37	0.06	-0.02	-0.11
PRACTICE TYPE AND FINANCIAL INCENTIVE -----				
IPA	0.0422 (0.0977)	0.0314 (0.0723)	0.4218 (0.2358)	0.3272* (0.1402)
FFS	0.4021* (0.1882)	0.8129** (0.1392)	2.1798** (0.4540)	2.0286** (0.2699)
FI=0	0.4105* (0.2015)	0.7073** (0.1490)	1.9939** (0.4859)	1.8701** (0.2889)
FI=1	0.4081 (0.1972)	0.7317** (0.1458)	1.9149** (0.4756)	1.9320** (0.2827)
FI=2	0.2380 (0.1365)	0.3019** (0.1009)	1.0351** (0.3292)	0.9913** (0.1957)
INTERCEPT	-0.4280* (0.2034)	0.7475** (0.1504)	-2.2106** (0.4905)	-2.0286** (0.2699)
ADJUSTED R2	0.04	0.77	0.62	0.82

*Indicates statistically significant results at the 0.10 confidence level.

**Indicates statistically significant results at the 0.05 confidence level.

(Standard errors are shown in parentheses)

Note: For all regressions the number of observations is 10.

F. PREGNANCY

Descriptive Analysis

The time frame for the analysis of physicians' services during pregnancy includes the entire pre-delivery period. While there are some significant differences in utilization, missing data is a key problem for this diagnosis.

All of the differences in utilization among practices shown on Table F.1 for pregnancy are significant. Although 13 practice sites have some data for pregnancy and over half of these sites have 30 cases, missing or incorrectly coded data is a problem. Because data for three sites, West IPA, Midwest FFS, and Central IPA, were based on insurance claims rather than office records, all office related data, e.g. lab tests, at these sites are incorrect and are omitted from this analysis. In addition, hospital admissions data at Midwest IPA, prescribed medication data at West and Central IPA, and C-section data at Midwest PGP are all in error. These missing data for these sites on Table F.1 lead to missing data problems in Table F.2 where data are translated into standardized units as well as on Tables F.3 and F.4 where the data are arrayed by practice type, region and organizational characteristics. For example, a special procedures standardized unit consisting of amniocentesis, pelvic sonogram, and C-section cannot be calculated for Midwest PGP because C-section data are missing. In turn, a total utilization standardized unit cannot be created for Midwest PGP because special procedures data are missing. Similar reasoning can be applied to each of the other sites with missing data. Thus, total standardized units are available for only 8 out of 13 sites. No data in total standardized utilization are available for the Midwest region, the IPA practice type or for peer interaction/quality assurance=0.

On Tables F.3 and F.4, missing data lead to different numbers of sites (or patient records) for each utilization measure. For example, the maximum number of IPA patients is 104 across four sites; Pacific IPA (29), West IPA (30), Midwest IPA (15) and Central IPA (30). This practice type has the most extreme missing data problem. On Table F.3, there are all four sites for amniocentesis, pelvic sonogram and C-section, three sites for hospital

admissions, and two sites for the remaining measures. On Table F.4, which shows standardized units, there are four sites for special procedures, three sites for hospital admissions, two sites for office visits, and only one site for total utilization standardized units.

Despite missing data, some interesting comparisons among sites can be made (Table F.1). On average, each pregnant patient made 10 or more office visits during her pregnancy. Except for Central PGP and Atlantic PGP few medications were prescribed on average. Mean hospital admissions are greater than one. This indicates that some patients were admitted more than once because of complications or because of false labor. Lab tests also varied markedly across sites with the two Midwest sites showing much higher values than in other areas. These high values do not seem to indicate a substitution with lab profiles, since the lab profile values for the Midwest sites are on a par with other areas. As expected, X-rays were rare in all sites. Amniocentesis was never reported at 5 sites, reported for one patient at 3 sites, and reported for two or more patients at 5 sites. Pelvic sonograms are far more common than amniocentesis, except for West IPA where only one pelvic sonogram was performed and West FFS where none were performed. Two sites were high utilizers of both procedures; Pacific IPA and Midwest PGP, while Pacific PGP, Pacific FFS, Central PGP, and Atlantic PGP were high utilizers of pelvic sonograms only. C-Section rates varied from none at Midwest IPA to almost a third of patients at Pacific PGP, West PGP, and Atlantic PGP.

Table F.3 shows mean utilization by practice type, region, and organizational characteristics. In terms of medications, pelvic sonograms and C-sections, the PGP practice type is the highest utilizer. While laboratory tests are also highest for PGPs, laboratory profiles are relatively low. This indicates that there may be a substitution between laboratory tests and laboratory profiles. In terms of standardized units (Table F.4), PGPs are the highest utilizers of medications and special procedures. The high use of pelvic sonograms in PGPs may relate to use of treatment protocols that call for sonograms in specified cases.

The highest utilization of office visits, amniocentesis and pelvic sonograms occurred in the Pacific region, while laboratory tests were highest in the Midwest (Table F.3). In terms of decisionmaking, the least centralized decisionmaking, DM=0, was associated with the highest utilization of medications and laboratory tests while the most centralized decisionmaking, DM=2, was associated with the highest utilization of lab profiles and pelvic sonograms. Again, in a setting with centralized decisionmaking, clinical profiles may lead to higher use of pelvic sonograms.

No clear patterns emerge for peer interaction/quality assurance, utilization review, or financial incentives on Table F.3. For pregnancy, the financial incentives variable is difficult to interpret because physicians' services are often included in a global fee, even in an FFS practice.

The differences in utilization of office visits shown on Table F.4 are significant for all the organizational variables except utilization review. For ambulatory care, neither decision making nor peer interaction/quality assurance show significant differences. For hospital admissions, only the financial incentives variable is significant at a .05 level, and for total utilization, there are no significant differences.

Regression Analysis

Table F.5 shows regressions controlling for age (over 35 or under 17) and geographic region for standardized ambulatory care, office visits, hospital admissions, and total utilization. The number of patients varies from 272 in the ambulatory care and office visits regressions to 338 in the hospital admissions regressions and 273 in the other regressions. These discrepancies arise because there are different numbers of practice sites with full data for each measure of utilization. Both age and region are significant in only the ambulatory care and office visits regressions.

After controlling for patient age and region, differences within categories of practice type for standardized units of office visits and ambulatory care that were significant on Table F.4, are no longer significant on Table F.6. This indicates that the observed variations on

Table F.4 really can be accounted for by underlying variation in patient age or region. As with the ulcer regressions, unrealistically high adjusted R^2 result from the small number of sites.

TABLE F.1 PREGNANCY -- MEAN UTILIZATION BY PRACTICE SITE

PRACTICE	# OF PATIENTS	OFFICE VISITS	MEDI-CATIONS	HOSP. ADMITS (b)	LAB TESTS	LAB PROFILES	X-RAYS	AMNIO CENTESIS	PELVIC SONOGRAM	C-SECTION
PACIFIC PGP	26	12.62**	0.19**	1.04**	11.27**	1.73**	0.08	0.08*	0.92**	0.31
PACIFIC IPA	29	14.66	0.48	1.03	10.03	2.21	0.07	0.14	0.62	0.24
PACIFIC FFS	30	14.07	0.37	1.03	8.30	2.00	0.03	0.10	0.60	0.17
MIDWEST PGP	30	12.43	0.33	1.10	18.43	0.17	0.00	0.00	0.27	0.27
MIDWEST IPA	30	(c)	(a)	1.20	(c)	(c)	(c)	0.03	0.03	0.23
MIDWEST FFS	28	12.75	0.29	1.14	14.93	0.18	0.00	0.00	0.00	0.18
WEST PGP	25	9.92	0.20	1.36	27.16	0.96	0.04	0.12	0.64	(d)
WEST IPA	15	12.00	0.60	(e)	29.87	1.00	0.00	0.00	0.13	0.00
WEST FFS	20	(c)	(c)	1.15	(c)	(c)	(c)	0.15	0.35	0.20
CENTRAL PGP	30	13.83	2.43	1.03	21.63	0.00	0.00	0.00	0.70	0.23
CENTRAL IPA	30	(c)	(a)	1.13	(c)	(c)	(c)	0.00	0.20	0.10
CENTRAL FFS	30	10.83	0.37	1.07	15.93	1.03	0.00	0.03	0.13	0.10
ANTIC PGP	30	12.77	2.00	1.00	19.40	2.27	0.07	0.03	0.80	0.27
ANTIC IPA+	--	---	---	---	---	---	---	---	---	---
TOTAL:	353									

Differences among the sites are statistically significant at a 0.10 level using analysis variance (ANOVA) across all sites.

Differences among the sites are statistically significant at a 0.05 level using analysis variance (ANOVA) across all sites.

Under ten patient records were obtained for T1 at this site.

Prescribed medication data are omitted for West IPA and Central IPA because of coding errors and lack of medications data on claims forms.

Eleven records which were missing data on hospital admissions were deleted. These were 5 records at Midwest PGP, 4 records at Pacific PGP, and one record at Pacific IPA and West FFS.

Office visits, lab profiles, lab tests and X-rays are excluded from the analyses for West IPA and Central IPA because claims data were used instead of patient records and for Midwest FFS because of coding errors.

Data on C-sections was missing in 27 of the 30 cases at Midwest PGP. The other 3 cases were coded as not receiving a C-section.

Hospital admissions data were coded incorrectly at Midwest IPA.

TABLE F.2 PREGNANCY -- MEAN STANDARDIZED UTILIZATION BY PRACTICE SITE

CE	NUMBER OF PATIENTS	OFFICE VISITS	PRESCRIBED MEDICATIONS	AMBULATORY CARE-TOTAL (j)	SPECIAL PROCEDURES	HOSPITAL ADMISSIONS	TOTAL W/MEDS (k)	TOTAL W/OUT MEDS (l)
IC PGP	26	16.60**	0.42**	25.04**	25.68**	159.40**	210.55**	210.1
IC IPA	29	19.41	1.06	28.99	19.72	158.79	208.56	207.5
IC FFS	30	19.40	0.81	30.61	14.93	158.61	204.96	204.1
PGP	30	16.65	0.73	26.27	17.92	168.84	213.76	213.0
IPA	30	(i)	(i)	(i)	14.31	184.19	(i)	(i)
FFS	28	16.89	0.63	23.49	11.04	175.42	210.19	209.5
ST PGP	25	11.98	0.44	25.02	(i)	208.75	(i)	(i)
ST IPA	15	14.49	1.32	24.79	1.01	(i)	(i)	(i)
ST FFS	20	(i)	(i)	(i)	15.25	176.52	(i)	(i)
AL PGP	30	18.45	5.35	29.76	17.82	158.61	210.95	205.6
AL IPA	30	(i)	(i)	(i)	7.73	173.96	(i)	(i)
AL FFS	30	14.71	0.81	21.99	7.12	163.73	193.65	192.8
TIC PGP	30	16.41	4.40	29.69	29.56	153.49	208.27	203.8
TIC IPA+	--	---	---	---	---	---	---	---
TOTAL	353							

Differences among the sites are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all sites.

Differences among the sites are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all sites.

Under ten patient records were obtained for T1 at this site.

Standardized unit values are missing because of missing raw data.

Ambulatory care standardized units (SU) = (office visits SU + lab profile SU + lab test SU + X-rays SU + other procedures SU)

Total standardized units (SU) = (ambulatory care SU + prescribed medications SU + special procedures SU + hospital admissions SU)

Total standardized units without medications = (ambulatory care SU + special procedures SU + hospital admissions SU)

TABLE F.3 PREGNANCY -- MEAN UTILIZATION BY PRACTICE TYPE, REGION,
AND ORGANIZATIONAL CHARACTERISTICS

	# OF PATIENTS	OFFICE VISITS	MEDI- CATIONS	HOSP. ADMITS	LAB TESTS	LAB PROFILES	X-RAYS	AMNIO- CENTESIS	PELVIC SONOGRAM	C- SECTION
PRACTICE SITE										
	141(m)	12.39**	1.09**	1.10	19.55*	1.01**	0.04	0.04	0.66**	0.27
	104(m)	13.75	0.52	1.12	16.79	1.79	0.05	0.05	0.26	0.16
	108(m)	12.53	0.34	1.09	13.01	1.09	0.01	0.06	0.27	0.16
GRAPHIC REGION										
FIC	85	13.82**	0.35**	1.04**	9.80*	1.99**	0.06**	0.11**	0.71**	0.24*
	88(m)	12.56	0.31	1.15	16.74	0.17	0.00	0.01	0.10	0.23
WEST	60(m)	10.70	0.35	1.26	28.17	0.98	0.03	0.10	0.42	0.11
TRAL	90	12.33	1.40	1.08	18.78	0.52	0.00	0.01	0.34	0.14
ANTIC	30	12.77	2.00	1.00	19.40	2.27	0.07	0.03	0.80	0.27
SIONMAKING (DM)										
0	78(m)	12.39**	1.39**	1.10	18.40**	0.09**	0.00	0.04	0.36**	0.21
1	204(m)	10.65	0.69	1.06	14.62	1.30	0.03	0.05	0.36	0.16
2	56(m)	13.39	0.29	1.04	9.68	1.88	0.05	0.09	0.75	0.23
R INTERACTION/QUALITY ASSURANCE (PI/QA)										
QA=0	30	---	---	---	---	---	---	0.03	0.03**	0.23
QA=1	104(m)	12.57**	0.46*	1.08	16.44**	1.49**	0.03	0.05	0.29	0.13
QA=2	85	11.81	0.88	1.14	21.34	1.14	0.04	0.05	0.56	0.19
QA=3	134	13.34	0.85	1.07	14.11	0.96	0.05	0.06	0.52	0.22
LIZATION REVIEW (UR)										
0	134(m)	12.56	0.32**	1.08	12.61**	1.23**	0.02	0.07	0.40	0.19
1	189(m)	12.80	1.24	1.05	20.53	1.32	0.04	0.05	0.47	0.17
2	30	12.43	0.33	1.10	18.43	0.17	0.00	0.00	0.27	0.27
ANCIAL INCENTIVES (FI)										
=-2	78(m)	13.41**	0.32**	1.10**	11.50	1.12**	0.02*	0.08	0.32**	0.18
=0	115(m)	12.18	1.03	1.16	22.12	0.34	0.11	0.03	0.40	0.24
=1	85(m)	13.64	0.93	1.02	16.14	1.92	0.06	0.07	0.68	0.23
=2	90(m)	11.63	0.35	1.10	15.93	1.03	0.00	0.02	0.17	0.10

Differences among the categories are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all categories.

Differences among the categories are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all categories.

Because of missing data for all measures of utilization except amniocentesis, pelvic sonogram, and C-section, the N may be lower than indicated.

TABLE F.4 PREGNANCY -- MEAN STANDARDIZED UNITS BY PRACTICE TYPE, REGION AND ORGANIZATIONAL CHARACTERISTICS

PRACTICE TYPE	NUMBER OF PATIENTS	OFFICE VISITS	MEDI-CATIONS	AMBULATORY CARE-TOTAL	SPECIAL PROCEDURES	HOSPITAL ADMISSIONS	TOTAL W/MED	TOTAL W/OUT MEDS
P	141(m)	16.15**	2.39**	27.29**	22.10**	168.73	210.90	208.09
A	104(m)	17.74	1.15	27.56	12.04	172.46	---	---
S	108(m)	17.00	0.75	25.40	11.81	167.71	202.76	202.01
GEOGRAPHIC REGION								
PACIFIC	85	18.54**	0.78**	28.35**	19.85**	158.91**	207.90	207.12
ST	88(m)	16.76	0.68	24.93	14.37	176.17	212.04	211.35
WEST	60(m)	12.92	0.77	24.92	9.15	194.42	---	---
NTRAL	90	16.58	3.08	25.87	10.84	165.43	202.29	199.21
LANTIC		16.41	4.40	29.69	29.56	153.49	208.27	203.88
DECISIONMAKING (DM)								
=0	78(m)	17.70**	2.71**	26.74	15.12	169.24	207.61	207.61
=1	204(m)	15.81	1.53	26.27	12.74	162.60	197.37	197.37
=2	56(m)	18.09	0.63	28.03	19.93	158.97	205.33	205.33
PER INTERACTION/QUALITY ASSURANCE (PI/QA)								
/QA=0	30	---	---	---	14.31**	184.19*	---	---
/QA=1	104(m)	16.51**	1.01**	25.30	9.85	165.60	200.97	200.04
/QA=2	85	15.19	1.94	27.11	15.71	175.16	218.74	218.74
/QA=3	134	17.89	1.84	27.37	17.13	164.95	206.66	206.66
UTILIZATION REVIEW (UR)								
=0	134(m)	16.91	0.82**	25.32**	14.42	166.09	202.41	202.41
=1	189(m)	16.48	2.37	28.07	13.84	160.80	198.27	198.27
=2	30	16.65	0.73	26.27	17.92	168.84	210.68	210.68
FINANCIAL INCENTIVES (FI)								
I=-2	78(m)	18.19**	0.96**	27.17**	13.48**	169.24**	204.01	204.01
I=0	115(m)	15.91	2.27	27.13	16.66	178.85	212.35	209.31
I=1	100(m)	17.04	1.93	27.54	20.61	157.10	209.06	207.02
I=2	60(m)	14.11	0.80	21.99	7.42	168.84	193.64	192.83

Differences among the categories are statistically significant at a 0.10 level using analysis of variance (ANOVA) across all sites.

* Differences among the categories are statistically significant at a 0.05 level using analysis of variance (ANOVA) across all sites.

Because of missing data for all measures of utilization except amniocentesis, pelvic sonogram, and C-Section, the N may be lower than indicated.

Table F.5 UTILIZATION OF SERVICES FOR PREGNANCY PATIENTS AS
A FUNCTION OF PATIENT AGE AND PRACTICE GEOGRAPHIC REGION

	OFFICE VISITS (SUOV)	AMBULATORY CARE (SUAC)	HOSPITAL ADMISSIONS (SUADM)	TOTAL UTILIZATION (WITH MEDS) (TSU)
AGE GT 35	-1.2485 (1.8106)	-0.7916 (1.0706)	-20.9892 (15.0531)	-17.4003 (17.2914)
AGE LT 17	-5.3237* (2.2215)	-3.4541** (1.3136)	29.2455 (15.9992)	8.1318 (20.9750)
PACIFIC	3.0698* (1.2594)	5.3915** (0.7447)	-35.3499 (10.4289)	0.1452 (10.7659)
WEST	-0.4213 (1.3546)	3.5727** (0.8010)	-18.5879 (10.4048)	3.9106 (11.3946)
CENTRAL	0.5910 (1.3469)	3.4287** (0.7964)	-30.7671 (10.3860)	-6.2654 (11.3283)
ATLANTIC	4.4212** (1.5839)	3.2778** (0.9366)	-41.5890 (13.3276)	--- ---
INTERCEPT	25.4813** (1.0687)	13.2836** (0.6319)	19.4807** (8.6293)	208.584** (9.2922)
ADJUSTED R ²	0.07	0.18	0.04	-0.01
N	273	273	338	273

* Indicates statistical significance at the 0.10 confidence level

** Indicates statistical significance at the 0.05 confidence level
(Standard errors are shown in parentheses)

TABLE F.6 DIFFERENCE BETWEEN ACTUAL AND EXPECTED UTILIZATION
FOR PREGNANCY PATIENTS AS A FUNCTION OF PRACTICE TYPE AND
ORGANIZATIONAL CHARACTERISTICS

INDEPENDENT VARIABLES -----	OFFICE VISITS (SUOV)	AMBULATORY CARE (SUAC)	HOSPITAL ADMISSIONS (SUADM)	TOTAL UTILIZATION (WITH MEDS) (TSU)
PRACTICE TYPE -----				
IPA	0.0716 (0.0662)	-0.0169 (0.0833)	0.0385 (0.0262)	---
FFS	-0.0098 (0.0520)	-0.0639 (0.0656)	-0.0159 (0.0248)	-0.0366 (0.0127)
INTERCEPT	-0.0089 (0.0323)	0.2291 (0.4065)	-0.0051 (0.0163)	0.0138** (0.0078)
ADJUSTED R2	-0.06	-0.13	0.15	0.51
DECISION MAKING (DM) -----				
DM=0	0.0744 (0.0570)	0.0619 (0.0752)	-0.0519 (0.0256)	0.0256 (0.0225)
DM=2	-0.0100 (0.0578)	0.0021 (0.0761)	-0.0228 (0.0290)	0.0011 (0.0228)
INTERCEPT	-0.0142 (0.0295)	-0.0140 (0.0389)	0.0157 (0.0135)	-0.0066 (0.0129)
ADJUSTED R2	-0.001	-0.1660	0.17	-0.09
PEER INTERACTION/QUALITY ASSURANCE (PI/QA) -----				
PI/QA=1	-0.0242 (0.0608)	-0.0731 (0.0704)	0.0272 (0.0292)	-0.0233 (0.0232)
PI/QA=2	-0.0405 (0.0583)	0.0028 (0.0676)	0.0177 (0.0297)	-0.0039 (0.0231)
INTERCEPT	0.0817 (0.0381)	0.0186 (0.0442)	-0.0117 (0.0173)	0.0069 (0.0135)
ADJUSTED R2	-0.20	-0.08	-0.10	-0.16
UTILIZATION REVIEW (UR) -----				
UR=0	-0.0242 (0.0751)	-0.1045 (0.0862)	0.0230 (0.0374)	-0.0214 (0.0242)
UR=1	0.0462 (0.0742)	-0.0103 (0.0852)	0.0634 (0.0366)	0.0119 (0.0249)
INTERCEPT	-0.0122 (0.0668)	0.0481 (0.0767)	-0.0418 (0.0388)	0.0059 (0.0215)
ADJUSTED R2	0.03	0.14	0.23	0.23

Table F.6 - PREGNANCY (cont.)

INDEPENDENT VARIABLES	(SUOV)	(SUAC)	(SUADM)	(TSU)
FINANCIAL INCENTIVES (FI)				
FI=0	-0.0114 (0.0640)	0.0592 (0.0594)	0.0327 (0.0335)	0.0367* (0.0143)
FI=1	-0.0238 (0.0621)	-0.0376 (0.0575)	0.0275 (0.0358)	0.0188 (0.0132)
FI=2	-0.1319 (0.0845)	-0.1556 (0.0784)	0.0417 (0.03492)	-0.0302 (0.0174)
INTERCEPT	0.0263 (0.0494)	0.0121 (0.4581)	-0.0255 (1.0258)	-0.0124 (0.0102)
ADJUSTED R2	-0.02	0.40	-0.17	0.67
PRACTICE TYPE AND DECISION MAKING				
IPA	0.0997 (0.0614)	0.0073 (0.9407)	0.0296 (0.0292)	--- ---
FFS	-0.0254 (0.0476)	-0.0779 (0.0731)	-0.0069 (0.0272)	-0.0426** (0.0056)
DM=0	0.1095 (0.0556)	0.0869 (0.0852)	-0.0357 (0.0309)	0.0354** (0.0066)
DM=2	0.0264 (0.0567)	0.0312 (0.0870)	-0.0072 (0.0335)	0.0132 (0.0067)
INTERCEPT	-0.0370 (0.0339)	-0.0013 (0.0520)	0.0038 (0.0200)	0.0041 (0.0039)
ADJUSTED R2	0.17	-0.312	0.09	0.91
PRACTICE TYPE AND PEER INTERACTION/QUALITY ASSURANCE				
IPA	0.1838 (0.1087)	0.1364 (0.1449)	0.0548 (0.0420)	--- ---
FFS	0.0155 (0.0674)	-0.0132 (0.0899)	0.0007 (0.0359)	-0.0442** (0.0108)
PI/QA=1	-0.1319 (0.0809)	-0.1556 (0.1079)	1.0010 (0.0327)	-0.0233 (0.0114)
PI/QA=2	-0.0326 (0.0619)	-0.0039 (0.0826)	0.0281 (0.0364)	-0.0264 (0.0126)
INTERCEPT	0.0108 (0.0180)	0.0253 (0.0641)	-0.0221 (0.0282)	-0.0294** (0.0086)
ADJUSTED R2	0.06	-0.12	-0.0009	0.72

Table F.6 - PREGNANCY (cont.)

INDEPENDENT VARIABLES -----	(SUOV)	(SUAC)	(SUADM)	(TSU)
PRACTICE TYPE AND UTILIZATION REVIEW -----				
IPA	0.0435 (0.0724)	-0.0482 (0.0862)	0.0243 (0.0303)	--- ---
FFS	0.0781 (0.0870)	0.0677 (0.1036)	-0.0117 (0.0437)	-0.0316 (0.0248)
UR=0	-0.1568 (0.1234)	-0.0845 (0.1044)	0.0325 (0.0536)	0.0029 (0.0298)
UR=1	0.0061 (0.0986)	0.0313 (0.0827)	0.0509 (0.0425)	0.0119 (0.0235)
INTERCEPT	0.0481 (0.0847)	0.0122 (0.0712)	-0.0418 (0.0365)	0.0059 (0.0253)
ADJUSTED R2	-0.05	-0.10	0.10	0.32
PRACTICE TYPE AND FINANCIAL INCENTIVE -----				
IPA	0.1076 (0.0676)	0.0565 (0.0723)	0.0350 (0.0363)	--- ---
FFS	0.0712 (0.0628)	0.0625 (0.0676)	-0.0163 (0.0704)	-0.0486 (0.0093)
FI=0	0.0597 (0.0577)	0.1217 (0.0621)	0.0073 (0.0743)	0.0064 (0.0124)
FI=1	-- --	-- ---	-0.0007 (0.0744)	-0.0297 (0.0111)
FI=2	-0.1319 (0.0754)	-0.1556 (0.0811)	0.0161 (0.0501)	-0.0302 (0.0081)
INTERCEPT	-0.0449 (0.0448)	-0.0504 (0.0482)	-0.0092 (0.0751)	0.0362 (0.0104)
ADJUSTED R2	0.18	0.36	0.22	0.92

*Indicates statistically significant results at the 0.10 confidence level.

**Indicates statistically significant results at the 0.05 confidence level.

(Standard errors are shown in parentheses)

Note: The regressions include 10 sites for office visits and ambulatory care,
12 sites for hospital admissions, and 8 sites for total utilization.

CHAPTER 8

CROSS DIAGNOSIS RESULTS

In this chapter, utilization of services is compared across all six diagnoses; cholecystitis, duodenal ulcer, otitis media, pediatric asthma, uterine bleeding, and pregnancy.

Several clear patterns emerge when ambulatory care standardized utilization and total standardized utilization are ranked as low, medium or high across sites for each diagnosis (Tables 8.1 and 8.2). These rankings are based on Table 2 for each diagnosis as reported in Chapter 7. The categorization is designed to group sites into approximately equal thirds and thus account for the variable number of sites across diagnoses. Although the differences in mean utilization are significant across all sites for all of the data reported as ranks here, it is important to note that differences between all possible pairings of sites are not necessarily significant.

Specific practice sites can be identified as generally low, medium, high, or mixed (Table 8.1). Both Midwest FFS and Central IPA are generally low relative to the other sites. Pacific PGP, and Pacific IPA are mostly medium with one or two diagnoses ranked high, while Midwest IPA is mostly medium with two low diagnoses. Pacific FFS is ranked as a high utilizer across all diagnoses while Central FFS is ranked high except for pregnancy. In fact, Central FFS shows the lowest ranking of all 10 sites with data for pregnancy. The remaining sites all have mixed ranks ranging from low to high. Thus, about half of the 14 practice sites can be characterized as low, medium, or high average utilizers of ambulatory care.

Clear practice type and regional patterns of standardized ambulatory care utilization also can be identified from Table 8.1. The three practices in the Pacific region are ranked either high or medium. Three of the FFS practices are ranked all high or all high except for pregnancy. The fourth FFS practice in the Midwest region is generally ranked low. The apparently

anomolous results for pregnancy may be explained by the fact that most OB/GYNS offer a global fee for normal delivery, pre and post-partum visits, and, therefore, are essentially prepaid.

In terms of total standardized utilization, specific sites can also be pinpointed as low, medium or high (Table 8.2). Midwest FFS, Atlantic PGP, and Central IPA generally are ranked low. Pacific IPA and West FFS generally are ranked medium. West IPA, Midwest PGP, and Central FFS are generally ranked high with the exceptions of ulcer at the first two sites and pregnancy at the third. Although only two diagnoses, otitis media and pediatric asthma, are analyzed for Atlantic IPA, both are ranked high. The remaining five sites all have mixed ranks.

Unlike ambulatory care, no clear patterns by practice type or region are evident from examination of site specific data for total utilization. However, several practices show similar patterns in Table 8.1, ambulatory care, and Table 8.2, total utilization. Central FFS is ranked high, except for pregnancy, for both ambulatory care and total utilization. Also, Central IPA and Midwest FFS are consistently ranked low while Pacific IPA is consistently ranked medium.

Part of the differences between ranking for ambulatory care and total utilization can be explained by the method used to calculate standardized units. The standardized unit for a hospital admission is far greater than for an office visit. For office visits, standardized units range from .966 for a brief visit to a primary care practitioner, to 2.871 for an extended visit to a specialist. For admissions, standardized units range from 104.009 for a pediatric asthma admission to 386.677 for a duodenal ulcer admission. Therefore, a practice where there are many office visits on average will rank high in terms of ambulatory care. However, that same practice with only a low hospitalization rate will rank low if other practices hospitalize more often. Furthermore, with a maximum of only 30 patients, small, probably random differences in infrequently occurring hospitalizations will swamp more consistent patterns in ambulatory care use.

On Tables 8.3 and 8.5, mean standardized units of ambulatory care and total utilization are ranked according to geographic region, with a rank of 1 the lowest. On Tables 8.4 and 8.6 mean standardized units of ambulatory

care and total utilization are ranked according to practice type and organizational characteristics. Rankings for Tables 8.3 through 8.6 all come from the data for each diagnosis on Tables 6 in Chapter 7. Thus, the rankings on Tables 8.4 and 8.6 are of mean utilization values adjusted for sex (where appropriate), age, and geographic region. Not all of the differences reported on Tables 8.4 and 8.6 are statistically significant. For example, on Table 8.6, the mean total utilization values for cholecystitis for FFS and PGP type practices are not significantly different although the FFS has a slightly lower value than the PGP. Similarly, after adjustment there are no significant differences for any diagnosis by financial incentives. Therefore, in contrast to the site specific data presented above, the data on Tables 8.4 and 8.6 should be viewed with even more caution and should be taken as representing general patterns of high and low utilization rather than statistically significant differences. Particular care should be exercised for duodenal ulcer and pregnancy where the analysis was limited to 9 and 8 sites respectively. As discussed in Chapter 7, missing data make the conclusions drawn about patterns for these two diagnoses particularly suspect.

The data on Table 8.4 confirm that FFS practices are generally high utilizers of ambulatory care except for pregnancy. Decisionmaking=1, defined as decisionmaking concentrated in a small group of managers, showed consistently low utilization of ambulatory care compared to generally medium utilization when there is diffuse decisionmaking, and generally high utilization when decisionmaking is highly centralized. With the exception of pregnancy and otitis media, those practices with some utilization review (UR = 1 or UR = 2) showed lower utilization than those with no utilization review. No clear patterns emerge for peer interaction/quality assurance. Ambulatory utilization is relatively high for financial incentives = -2, a situation where both group incentives and individual incentives are to increase utilization. Except for cholecystitis and pregnancy, utilization is lowest for FI = 0, a case where individual and group incentives are opposite.

For total utilization, FFS sites rank the highest and IPAs the lowest or second lowest except for pregnancy (Table 8.6). Highly centralized decisionmaking, DM=2, is associated with high total utilization, while more

diffuse decisionmaking is associated with low utilization. Except for duodenal ulcer, high utilization is found for sites with low peer interaction/quality assurance. Except for pregnancy, high utilization is shown for FI = 2, a situation with all incentives to constrain utilization. This result may be caused by the much larger impact of inpatient care than ambulatory care in the calculation of total utilization.

Thus, clear patterns of high or low utilization of ambulatory care and total care by specific practice sites appear across all six diagnoses. In addition, FFS show high utilization for both ambulatory care and total utilization. Some utilization patterns by organizational characteristics are suggested by the data. However, these patterns do not always reflect statistically significant differences in utilization across organizational categories.

TABLE 8.1
RANKING BY SITE FOR AMBULATORY CARE STANDARDIZED UTILIZATION

PRACTICE SITE -----	DIAGNOSIS -----					
	CHOLECYSTITIS	DUODENAL ULCER	OTITIS MEDIA	PEDIATRIC ASTHMA	UTERINE BLEEDING	PREGNANCY
PACIFIC PGP	---	---	med	med	high	med
PACIFIC IPA	high	---	med	med	med	high
PACIFIC FFS	high	high	high	high	high	high
WEST PGP	---	low	low	high	low	med
WEST IPA	low	med	high	high	med	---
WEST FFS	med	high	high	high	med	low
MIDWEST PGP	high	low	high	low	low	med
MIDWEST IPA	med	---	med	med	low	low
MIDWEST FFS	low	med	low	low	low	---
CENTRAL PGP	med	low	med	med	high	high
CENTRAL IPA	low	med	low	low	med	---
CENTRAL FFS	high	high	high	high	high	low
ATLANTIC PGP	---	---	low	---	high	high
ATLANTIC IPA	---	---	high	low	---	---

Note: For diagnoses with 10 sites, cholecystitis, low = 1-3, med = 4-6, and high = 7-10. For diagnoses with 13 sites, otitis media, pediatric asthma, and uterine bleeding, low = 1-4, med = 5-8, and high = 9-13. For diagnoses with 8 sites, pregnancy, low = 1-3, med = 4-5, and high = 6-8.

TABLE 8.2
RANKING BY SITE FOR TOTAL STANDARDIZED UTILIZATION

PRACTICE SITE	CHOLECYSTITIS	DUODENAL ULCER	DIAGNOSIS		UTERINE BLEEDING	PREGNANCY
			OTITIS MEDIA	PEDIATRIC ASTHMA		
PACIFIC PGP	---	---	med	high	low	high
PACIFIC IPA	med	---	med	low	med	med
PACIFIC FFS	high	high	high	med	low	low
WEST PGP	---	high	low	high	low	high
WEST IPA	high	med	high	high	high	---
WEST FFS	low	med	---	med	med	med
MIDWEST PGP	high	low	high	high	high	---
MIDWEST IPA	low	---	med	med	high	---
MIDWEST FFS	med	low	low	low	med	---
CENTRAL PGP	med	med	med	low	high	high
CENTRAL IPA	low	low	low	low	med	---
CENTRAL FFS	high	high	high	med	high	low
ATLANTIC PGP	---	---	low	---	low	low
ATLANTIC IPA	---	---	high	high	---	---

Note: For diagnoses with 10 sites, cholecystitis, low = 1-3, med = 4-6, and high = 7-10.
For diagnoses with 13 sites, otitis media, pediatric asthma, and uterine bleeding, low = 1-4, med = 5-8, and high = 9-13. For diagnoses with 8 sites, pregnancy, low = 1-3, med = 4-5, and high = 6-8

TABLE 8.3
RELATIVE RANKING OF AMBULATORY CARE UTILIZATION
BY GEOGRAPHIC REGION

REGION -----	DIAGNOSIS -----					
	CHOLECYSTITIS	DUODENAL ULCER	OTITIS MEDIA	PEDIATRIC ASTHMA	UTERINE BLEEDING	PREGNANCY
PACIFIC	4	4	3	4	3	1
WEST	1	2	5	5	2	3
MIDWEST	2	1	2	2	1	2
CENTRAL	3	3	1	3	4	5
ATLANTIC	---	---	4	1	5	4

Note: Relative rankings are based on the data shown on Tables 4 in Chapter 7.

A rank of 1 is lowest and 5 is highest.

TABLE 8.4

RELATIVE RANKING OF AMBULATORY CARE UTILIZATION BY PRACTICE TYPE,
AND ORGANIZATIONAL CHARACTERISTICS

INDEPENDENT VARIABLES -----	DIAGNOSIS -----					
	CHOLECYSTITIS	DUODENAL ULCER	OTITIS MEDIA	PEDIATRIC ASTHMA	UTERINE BLEEDING	PREGNANCY
PRACTICE TYPE -----						
PGP	3	1	1	1	2	2
IPA	1	2	2	2	1	3
FFS	2	3	3	3	3	1
DECISION MAKING (DM) -----						
DM=0	3	3	1	2	2	2
DM=1	1	1	2	1	1	1
DM=2	2	2	3	3	3	3
PEER INTERACTION/QUALITY ASSURANCE (PI/QA) -----						
PI/QA=0	1	1	4	4	1	---
PI/QA=1	2	4	2	3	2	1
PI/QA =2	4	2	1	1	3	3
PI/QA =3	3	3	3	2	4	2
UTILIZATION REVIEW (UR) -----						
UR=0	2	3	2	3	3	1
UR=1	1	1	3	2	1	2
UR=2	---	2	1	1	2	3
FINANCIAL INCENTIVES (FI) -----						
FI= -2	3	3	3	3	4	3
FI=0	4	1	1	1	1	4
FI=1	1	---	2	4	3	2
FI=2	2	2	4	2	2	1

Note: Relative rankings are based on the regression equations shown on Table 6 in Chapter 7. A rank of 1 is lowest and 4 is highest.

TABLE 8.5
RELATIVE RANKING OF STANDARDIZED TOTAL UTILIZATION
BY GEOGRAPHIC REGION

REGION -----	DIAGNOSIS -----					
	CHOLECYSTITIS	DUODENAL ULCER	OTITIS MEDIA	PEDIATRIC ASTHMA (a)	UTERINE BLEEDING	PREGNANCY
PACIFIC	4	4	3	2	2	2
WEST	3	3	5	5	3	4
MIDWEST	1	1	2	3	4	---
CENTRAL	2	2	1	1	5	1
ATLANTIC	---	---	4	4	1	3

a. For otitis media, the rankings are from ambulatory care since data on specialized procedures and hospital admissions are not available for this diagnosis.

Note: Relative rankings are based on the data shown on Tables 4 in Chapter 7.
A rank of 1 is lowest and 5 is highest.

TABLE 8.6

RELATIVE RANKING OF STANDARDIZED TOTAL UTILIZATION BY PRACTICE TYPE,
AND ORGANIZATIONAL CHARACTERISTICS

INDEPENDENT VARIABLES -----	DIAGNOSIS -----					
	CHOLECYSTITIS	DUODENAL ULCER	OTITIS MEDIA	PEDIATRIC ASTHMA(a)	UTERINE BLEEDING	PREGNANCY
PRACTICE TYPE -----						
PGP	3	2	1	3	1	2
IPA	1	1	2	1	2	---
FFS	2	3	3	2	3	1
DECISION MAKING (DM) -----						
DM=0	1	3	1	1	1	3
DM=1	2	1	2	2	3	1
DM=2	3	2	3	3	2	2
PEER INTERACTION/QUALITY ASSURANCE (PI/QA) -----						
PI/QA=0	4	1	4	3	4	---
PI/QA=1	1	2	2	1	3	1
PI/QA =2	3	3	1	4	1	2
PI/QA =3	2	4	3	2	2	3
UTILIZATION REVIEW (UR) -----						
UR=0	2	2	2	2	3	1
UR=1	1	1	3	1	2	3
UR=2	---	3	1	3	1	2
FINANCIAL INCENTIVES (FI) -----						
FI= -2	2	1	3	1	2	2
FI=0	4	2	1	4	1	4
FI=1	1	---	2	2	3	3
FI=2	3	3	4	3	4	1

Note: Relative rankings are based on the regression equations shown on Table 6 in Chapter 7. A rank of 1 is lowest and 4 is highest.

CHAPTER 9

SUMMARY OF RESULTS AND LESSONS FOR THE DESIGN AND IMPLEMENTATION OF FUTURE STUDIES

The purpose of this project was to study differences in utilization of services in different physician practice arrangements, and to test whether these differences can be explained by the type of practice setting (i.e. FFS, IPA, or PGP), or specific organizational characteristics (e.g., centralized decisionmaking). The goals of the project were ambitious in the sense that little empirical work had been done relative to the number of policy concerns, and, there was little experience with the feasibility of the research approach. Thus, the findings relate both to the specific research questions and to the design and implementation of similar studies. In this chapter, results are summarized, research design and implementation issues are raised, and policy implications are discussed.

A. SUMMARY OF RESULTS

This project has demonstrated that clear differences exist in utilization of specifically identified services across practice sites. While most previous studies have been focused on differences in total costs or overall utilization across various practice arrangements, specific services linked to specific diagnoses have been measured in this study. Even though there was a maximum of only 30 patients with each diagnosis at each practice site, significant differences in utilization across sites have been shown for 37 out of 48 measures of utilization. (See Tables 1 for each

diagnosis in Chapter 7.) Generally, the services for which differences across sites are insignificant are of low frequency, e.g., X-rays for pregnant patients. Before the analysis, there was little reason to believe that 30 patients would be enough to detect significant differences across sites.

In addition to practice setting and organizational factors, there are numerous explanations for these observed differences among practice sites. First, patients at some sites may be more severely ill than patients at other sites. For example, more potentially complicated cases might be seen at some sites because of the availability of certain specialists. Alternatively, severely ill patients may be referred-out of some practices to be treated by specialists. Second, sites may differ in reporting utilization. For example, some sites may systematically fail to report procedures, such as laboratory tests, on the patients' office medical records.

Several practice sites were identified as high or low average utilizers of services across a range of six quite different diagnoses. Not only are some practice sites using many resources to treat one diagnosis, but utilization is high across the board. These patterns of high or low utilization across diagnoses are more clear for general ambulatory care than for total utilization including hospital admissions and specialized services.

In some cases, these patterns fit prior expectations. For example, FFS practices are generally high utilizers of ambulatory care except for pregnancy. However, physician care during pregnancy and delivery often is paid at a global fee, even in FFS practices. Therefore, physicians in these practices do not face the same financial incentives for pregnant patients as for patients with other diagnoses. The fact that pregnant patients in PGPs are, on average, medium or high users of services compared with those in IPAs or FFS practices, also might be explained by the use of lower paid nurses or nurse-midwives in PGPs who may make possible more frequent visits.

One goal of this study was to identify factors which explain utilization levels other than the classification of practices such as IPAs, FFSs or PGPs. For example, one reason PGPs are thought to have lower

utilization compared to FFS practices is because of centralized decisionmaking or structured utilization review. In this study, efforts were made to evaluate decisionmaking and utilization review as separate from the organizational arrangement such as a PGP or FFS practice. This goal was only partially realized.

While a few patterns of utilization according to organizational categories were noted, the results were usually statistically insignificant. Patterns of ambulatory care utilization were found for centralization of decisionmaking and financial incentives. Highly centralized decisionmaking was not associated with lower utilization. This association may be expected if the organizational structure acts to set strict utilization standards. However, the effects of centralized decisionmaking also depend on the goals of the organization. When financial incentives of the group and of individual physicians are to increase utilization, generally high ambulatory care utilization is found. Patterns of total utilization were found for peer interaction/quality assurance and financial incentives. For low peer interaction/quality assurance, as well as for the case when both individual physician and group incentives are to constrain utilization, total utilization is generally high. Thus, for financial incentives, opposite results are found for ambulatory and for total utilization.

While these results show some utilization differences by organizational factors, the differences often are not statistically significant. So, caution must be exercised in drawing broad implications from these findings.

One reason for these results may be the difficulty of defining organizational measures. Difficulties arise both in (1) defining categories for a variable such as decisionmaking, and (2) obtaining accurate information. For example, does decisionmaking pertain to a centralized group that makes policy decisions at the top management level of a large prepaid group practice with several sites? Or, does centralized decisionmaking really pertain to a single individual making all decisions at one ambulatory care site? In addition, the influences of these organizational characteristics are difficult to examine separately. For instance, the effect of centralized decisionmaking depends on the individual physicians' and groups' financial incentives.

Often, information about the internal dynamics of an organization is hard to obtain through structured interviews. For example, a practice might have a utilization review committee that meets frequently and appears to be effective but, in fact, the committee only addresses the treatment of rare or complicated cases. Such a committee may exert little influence on general utilization of services. Or, a practice may appear to an interviewer to be led by a team of managers when one strong leader is actually responsible for all key decisions. In addition to the difficulties arising from how organizational variables are coded, the availability of only a maximum of 14 sites (and in many instances substantially fewer sites), results in a severe shortage of degrees of freedom. Thus, some of the apparent findings may be the result of a single site with an extremely high value or they may be due to other variables correlated with our measures in this extremely small sample.

B. RESEARCH DESIGN AND IMPLEMENTATION

Issues of research design and implementation can be divided into two parts. First, how might a study similar to the one described here be better designed and implemented? That is, how could improvements be made on a study of patients with selected diagnoses at selected sites? Second, what other general approaches might be taken to study utilization in different practice settings?

As the previous section indicated, the goals of the project were met with mixed success. In some instances substantial variation across sites was observable, but in other cases results were difficult to interpret. However, because this project was among the first of its kind, there is much that can be learned from the problems that arose, in order to help improve future research. It is convenient to categorize these lessons into those relating to project design and those relating to research implementation.

Design Issues.

There are five major design issues that should be addressed by future studies. The first relates to the aspects of the organizational characteristics that may bias the measured differences in utilization. The second design issue concerns the appropriate measures of differences in illness among patients, including complications, referral patterns, and the appropriate time period for study. The third issue is the choice of appropriate diagnoses to study. The fourth issue relates to choices to be made among the type of data to be used (insurance claims vs. office medical records). The fifth concerns issues of statistical power and the appropriate number of sites and patients needed to test hypotheses.

Organizational Characteristics That May Bias Measured Differences.

Precisely because the focus of studies like this is the investigation of organizational factors, particular care must be taken to avoid measurement biases that may be associated with organizational factors. Three areas of particular concern are patient selection of physicians, payment schemes, and equipment availability.

Patient Selection of Physicians.

Variations in observed utilization may be a reflection of patient self selection as reflected by their choice of physicians or differences among physicians within practices. Patients may, and often do, choose physicians that fit their own preference for a particular style of medical care. One physician may encourage a patient to come in for an office visit at the first indication of a problem, while another physician may try to provide patients with enough information to make a self-diagnosis for relatively minor problems. Because of these differences in practice style, patients may enter treatment at different stages of a disease. For the first type of physician, a large percentage of patients would be relatively healthy, while for the second type it is likely that patients will be in a later stage of illness that could not be treated through self-care. One way to quantify this "style of care" is to develop a measure of the typical response to several common illnesses of each physician studied. This response could be

simulated in the interviewing stage of the study by asking the doctor questions about his/her normal response to a series of hypothetical patients. Possible responses would range from encouraging patients to come in for nearly every problem to having patients come in for a new problem and providing education about proper indications of when a doctor visit is called for and when a visit is unnecessary, to having nurses screen calls and provide information for treatment over the phone. Unless one can obtain a very large sample of patients for each physician and have very sensitive measures of disease severity on entry, it is probably not feasible to use observed practice patterns to make such a differentiation.

Additionally, a physician identifier should be included (in the form of an ID code rather than something that would reveal the true identity of the physician) to allow differentiation between utilization of a specific physician and utilization of an entire group practice. It is possible that a single physician in a group is responsible for most of any "excess" utilization. In addition to a physician ID code, some way of identifying multiple providers serving the same patient should be developed.

Payment Methods.

For some diagnoses such as pregnancy and for most surgeries, a global fee is paid to cover the expected cost of care. For pregnancy, covered services typically include prenatal visits, physician's services in the delivery room, and postnatal visits. Usually special tests, such as sonograms, are not covered. Therefore, these patients are essentially prepaid for the number of office visits, although they may be seen at an FFS practice or an IPA. For these types of procedures and diagnoses, a study of utilization should focus on measuring efficiency. Appropriate variables to measure would be use of ultrasound, amniocentesis, and other special procedures for which there are separate fees in the FFS environment, while controlling for case mix.

In looking at FFS or IPA sites which have both prepaid and fee-for-service patients, it is crucial to make sure to differentiate among patients by payment source. Depending on the aim of the study, one could focus on prepaid or fee-for-service patients exclusively. Alternatively, and perhaps

more interestingly, one could expand the sample of patients at such sites to test whether the same MDs use different practice patterns for patients with different payment schemes. Furthermore, one might explore how the relative percentage of a physician's practice devoted to either prepaid or fee-for-service patients affects that physician's overall practice patterns.

Equipment Availability.

Differences across practice sites in capacity to perform tests can lead to a variation in measured utilization which does not reflect a true difference in practice style. In measuring the degree of utilization of resources for a particular diagnostic procedure, there are two main issues:

- (a) whether the test is more appropriately done on an outpatient versus an inpatient basis for a particular patient, and
- (b) whether a practice site has the necessary equipment and personnel available to perform the procedure on an outpatient basis.

Future studies should examine the underlying reasons for ordering tests on an inpatient basis when appropriate facilities are available to perform the tests as outpatient procedures. When the facilities are unavailable at the practice site, tests must be administered elsewhere, either at a free-standing laboratory, or in the hospital on an outpatient or inpatient basis. These differences should be considered when aggregating utilization into total utilization scores. For instance, the weight assigned to a one-day hospitalization to perform a simple procedure such as a fiberoptic scan when the practice lacks the equipment to perform the procedure in its offices should be similar to that used when the scan is done in the hospital but on an outpatient basis, or in the medical clinic.

Capture Patient Differences in Measured Utilization.

Differences in measured utilization across sites also can result from variation in illness among patients. This variation should be carefully controlled for and, the availability of adequate severity measures should be one criterion in the selection of diagnoses for study.

The appropriate time period for studying an episode of illness should be defined in advance of the study. For example, uterine bleeding from a myomatous uterus may recur over a period of many months (even years) before the decision for hysterectomy is made, sometimes after menopause. Furthermore, it is important to discriminate between chronic conditions, acute conditions, and an acute flare-up of a chronic condition. More utilization of resources (especially tests) is likely to take place when a diagnosis is unclear than when a patient is having a flare-up of a previously diagnosed problem. For instance, in this project several cholecystitis patients had the surgical procedure cholecystectomy but had no recorded diagnostic tests. (However, tests may have been performed in the hospital but not recorded on the ambulatory record from which data for this study is taken.) Alternate explanations are that the tests indicating the need for the cholecystectomy were performed during a previous episode of cholecystitis or that the patient had the tests at another practice site and was referred to a physician in the sample after a clear diagnosis had been made.

It is essential to capture information on whether a patient has been referred to a practice site or has received all treatment for a specific problem at the same site. If the purpose of the study is to examine practice patterns within sites, all referral patients should be eliminated from the sample. This is true for referrals both into a site and out to another site or physician, unless the utilization of the referral sites can be linked back to the primary care physician.

A crucial component in explaining differences in utilization among patients is severity of the disease, or any complicating factors. Variables which explain these differences should be defined in the study, with the assistance of a physician consultant. The variable definitions must be sufficiently detailed to allow for a range of responses by the patients. For example, if 90 percent of all pregnant patients complain of nausea, this symptom will not be useful for differentiating among patients.

Only data pertinent to the each diagnosis should be collected. For example, a pregnancy case should not have X-rays recorded as utilization related to pregnancy if the X-rays are for some other problem, such as a sprained ankle. In cases where unusual or unexpected data appear, the

medical records should be examined carefully for information which may provide indications about complications. At the same time, more specific patient data should be collected in order to control for differences in case-mix of patients and the effect of such differences on utilization.

Diagnosis Selection.

The results of this study point out some difficulties in selecting diagnoses. Both cholecystitis and pediatric asthma are chronic conditions that need to be followed for a long period of time. Furthermore, cholecystitis has both a chronic and an acute phase; it is essential to differentiate utilization between these phases. Acute otitis media is a recurring condition for some patients and a single or or infrequent illness in other patients. Treatment differs for these two populations. For uterine bleeding, the period of observation can even continue for many years and treatment differs according to patient ages. Even in FFS settings, pre-natal care and delivery are covered under a global fee. Finally, for duodenal ulcer, recently developed drug treatment led to difficulties in identifying enough cases to study. Thus, careful attention must be paid to selecting specific criteria for the selection of diagnoses and ensuring the participation of relevant clinical specialists.

Appropriate Data Use.

The use of office medical records data at some sites and insurance claims data at other sites causes problems of comparability across sites. Because office-based data and claims data are not good substitutes for each other, the same type of data should be used for all sites. To obtain the maximum information the best approach is to use both types of data. This would provide an internal check for validity, as well as fill in information that might be lost if only one or the other type of data are used.

Medical records contain detailed descriptions of patients' complications which are not available on claims forms. Because the level of detail on a medical record may vary across sites or among physicians within a site, the amount of data above a minimum commonly recorded baseline will also vary. So, a patient for whom more complications are noted on the

record may appear to be more seriously ill than the same patient at another site if fewer complications are routinely recorded. The most serious drawback in ambulatory medical records data is that information on hospitalization generally is limited only to an indication that a hospitalization occurred. Thus, any study in which both ambulatory and inpatient utilization are both analyzed must include a better source of inpatient data than physicians' office records.

Claims data provide better information about the length of a hospital stay and procedures and tests performed during that hospitalization. Medications data are generally lost when only claims data are used. Often only those procedures which an insurer covers appear on claims forms. So if a service performed during an office visit is not covered by the patient's insurance policy, a claim may never be filed. Some special diagnostic tests may also not be covered by some insurers, or may be covered only for certain purposes. For instance, Blue Shield will pay for ultrasound during pregnancy only to rule out expected or potential complications. Any ultrasound performed for another purpose would not be reimbursed, and might not be recorded on a claims record. For pregnancy or some surgical procedures where the physician's work in the hospital is part of a global fee, claims data does not provide enough detail. Furthermore, within an FFS practice, different patients' insurance policies may offer different levels of coverage. Therefore, the claims data would vary within a practice in completeness. Finally, in a PGP that runs its own hospital, such as Kaiser, claims data may not exist at all.

While claims data provide a less rich source of information about utilization than do medical records, the cost of a study using claims data is significantly lower. Claims or billing data for many practice sites are already collected and often computerized, so that a researcher only has to specify the correct data elements to begin. Use of medical records on the other hand, requires the costly and time-consuming design and pretest of a data collection instrument, collection of the data at each site, and keypunching the data into the computer.

Statistical Power and Hypothesis Testing.

A major issue in designing a study of variation of utilization among different practice types is the number of practice sites and the number of patients at each site that need to be examined to provide meaningful results. We have found that with as few as 10 - 30 patients per diagnosis at each site it is possible to detect significant differences in utilization across practice sites.

The number of sites needed will depend on the number and type of hypotheses being tested. As few as 14 sites can provide answers to relatively simple questions such as, are there differences in utilization among the PGPs, IPAs and FFS settings examined. However, a sample this small provides little power to discern relatively small, but nonetheless important differences across sites. More complex questions concerning the impact of different organizational characteristics (such as degree of centralization of decision-making or amount of peer interaction) on utilization, require a larger data base. Also, 14 sites are clearly not really representative of general types of practices. For example, one of the FFS practices is known to be a referral center. The data collected for this project could be used to estimate the number of sites needed to test the various hypotheses by using variance estimates within and across sites.

Given the major differences in the organization of IPAs with many independent practitioners, those with a network of small groups and sites with large multispecialty groups, such as PGPs, entirely different sets of variables may be necessary to characterize organizational differences. For example, one IPA studied here consisted of 600 physicians in 11 group practices. While there may be substantial peer interaction within each of the 11 groups, there is little interaction among the groups. Another IPA includes 150 physicians operating either in groups or solo practice.

Implementation Issues.

Future studies of utilization patterns should pay equal attention to proper design, which has the potential to provide all of the necessary information, and proper implementation, without which the information

gathered may be different from what was intended. Proper implementation of the study design can be facilitated through the following measures:

- o well written coding forms
- o unique patient identification numbers
- o careful calculations
- o pretests of the coding forms

The coding sheet for collecting medical records data should be designed to provide internal checks on validity and to allow the abstractor to enter all pertinent information. For instance, there should be space on the coding sheet to indicate whether a variable has a value of 0 or whether the information is missing. Similarly, it must be clear whether a pregnant woman did not have a C-section or whether the data to determine whether a C-section was performed are not available.

Redundancies should be built into the coding sheet to assure that the information is correct and complete. For example, the abstractor should check to make sure that the sum of all the office visits recorded is equal to the value for total office visits.

To provide an easier means of checking and correcting the data, unique patient IDs should be assigned to each observation. If IDs previously have been assigned for the purpose of medical record-keeping at the site, an additional ID should be assigned for the study.

In aggregating utilization into standard scores of total utilization the algorithm should be relatively insensitive to missing values. For instance, in using the Statistical Analysis System (SAS), the sum function [e.g., $SU = \text{sum}(\text{of MED OV})$] will give a value even if either MED or OV is missing while simply adding the variables (e.g., $SU = \text{MED} + \text{OV}$) will result in SU being missing if either of the other two variables is missing. In some instances, one may be willing to assume that missing values for certain sub-categories (e.g. medications) are relatively unimportant and can be treated as zeros.

To assure that each site has sufficient patients for each diagnosis being studied, an advance check should be made, dropping sites which do not have sufficient data in advance. This may also require an adjustment to the design or the recruiting of substitute sites.

Additionally, to ensure that all data elements are available, a pretest of the data collection instrument should be performed, particularly to ensure that variations exist in patient complaints. A physician consultant should be included in the pretest team to make certain that all pertinent information is being collected and to look for clues to complications which might lead to higher utilization. In addition, members of the research team, as well as medical records coders, should review patient records to see if additional information can be gleaned from the records. If possible, the same team of coders should be used across all sites to eliminate inter-coder bias. If this is impractical, all coders should receive the same training and should be closely monitored throughout the data collection. Sufficient time should be budgeted to check the data for consistency at two stages of the study, both at the beginning in the pretest stage, and at the start of the analysis stage.

As a further test of the accuracy of the data, as well as a test of total costs of utilization, dates should be recorded for all special procedures and diagnostic tests. For example, it would be useful to know whether a patient with uterine bleeding had a D&C and a hysterectomy during the same hospital admission, or whether these procedures were performed on different dates.

Other Research Approaches.

This research project is a departure from previous studies of HMOs, PGPs and IPAs because it is based on utilization for patients with specific diagnoses rather than on all enrollees of a practice. Rather than comparing hospitalization rates for all enrollees, this study compares hospitalization rates for patients with a specific diagnosis using this method, so some kinds of biases are eliminated. For instance, if one practice treats many patients with cholecystitis and the hospitalization rate for this diagnosis is high, this practice will seem to have high overall hospitalization rates compared with practices with fewer patients with cholecystitis. By comparing only patients with cholecystitis, this problem is eliminated.

However, two key questions remain; (1) are patients in various practice types diagnosed similarly, and once diagnosed, (2) are patients referred into or out of different practice types at different rates.

In many instances, attaching a diagnosis to a patient's symptoms is largely a function of the physician's clinical judgement. Especially for minor complaints patients may not be classified as having a specific condition. For instance, an isolated instance of wheezing may be classified as pediatric asthma at one practice site, and not at another. Thus, even a diagnosis specific study of utilization will not measure systematic differences among practices in either stated or unstated differences in making diagnoses. This suggests that patient symptoms, rather than diagnoses, be the focus of future studies. Alternatively, unambiguous physiological measures should be used to adjust for patient mix.

The second question, how patients enter and leave practices, also requires a different research approach than was followed here. Rather than focusing on a relatively short episode of care, data must be gathered for a longer time period to fully track a patients' treatment for a given condition across different practice settings. For example, some people argue that HMO enrollees leave the plan (either through out-of-plan services or through disenrollment) when they become sick. Relatively short follow-up periods would miss this type of behavior.

Policy Implications.

It would be most satisfying if the data from this study could provide clear evidence that prepaid group practices, or practice sites with centralized decisionmaking, are more conservative in their use of specific medical services for patients with given diagnoses. Such findings would go a long way toward answering how such plans achieve their measured lower overall costs. Unfortunately, the sample of 14 sites, which was limited both because of resource constraints, available candidates, and willingness to cooperate, is far too small to draw all but the most tentative conclusions. Furthermore, generalization to all prepaid groups or organizational forms is inappropriate given the small, non-random sample.

Several findings, however, are worth underscoring. First, with the rather blunt instruments available, differences across sites could be detected for these largely ambulatory care conditions. This suggests that the variations in surgical and hospital use identified by Wennberg and others are also occurring in ambulatory care. Second, more than half the sites exhibited reasonably consistent practice patterns across all the diagnoses. This suggests that it may be possible to develop a set of tracer conditions that could be used to represent overall practice patterns. While it is premature to reach such a conclusion, the findings are encouraging. If a set of tracers were developed, they could be used by insurers or Medicaid programs in selecting efficient plans for contracting purposes.

The findings with respect to practice type are both reassuring and surprising. The fee-for-service settings were generally high utilizers of ambulatory services, except for maternity care. This is consistent with theoretical expectations, and supports the notion that increased use of global fees for physician services might produce cost savings even in the absence of major organizational modifications. Perhaps most surprising were the generally high utilization rates for the prepaid group practices compared to IPAs or FFSs. This may be a result of different case mix. For example, PGP physicians may use more stringent criteria in assigning a diagnosis, so their patients in our sample may be more severely ill.

It must also be remembered that most of the work indicating lower utilization in PGPs is population, (or enrollment) rather than patient based. The comparison is usually with open-ended insurance and independent fee-for-service practitioners, rather than multispecialty group practices (our FFS sites) or IPAs. Finally, the vast majority of the published studies showing lower use for PGP enrollees focuses on the large, mature HMOs such as Kaiser-Portland or Group Health Cooperative. Our PGP sites do not include such large mature plans, and the difference in findings may suggest that the earlier results are not generalizable to all PGPs. It is also important to recall that in most previous studies, prepaid group practices were compared with independent fee-for-service practitioners. Our comparisons are among PGPs, FFS groups, and IPAs. It may be the case that all three forms are low utilizers relative to independent fee-for-service

practice, but that comparison was not feasible because of difficulties in data collection. With the insights of this study into the possibilities and pitfalls of practice pattern analyses, future studies may help resolve the remaining questions.

APPENDIX A:

AN ILLUSTRATION OF THE METHODOLOGY FOR CALCULATING
AVERAGE RELATIVE VALUE WEIGHTS USING THE DIAGNOSTIC
TESTS PERFORMED ON CHOLECYSTITIS CASES IN THREE DIFFERENT PLANS

APPENDIX A: AN ILLUSTRATION OF THE METHODOLOGY FOR CALCULATING AVERAGE RELATIVE VALUE WEIGHTS USING THE DIAGNOSTIC TESTS PERFORMED ON CHOLECYSTITIS CASES IN PACIFIC REGION PRACTICES

DIAGNOSTIC TESTS PERFORMED	AVERAGE RELATIVE VALUE WEIGHTS FOR DIAGNOSTIC TESTS			
	PACIFIC FFS NUMBER x CRVS = OF UNITS TOTAL RVS ₁₁	PACIFIC PCP NUMBER x CRVS = OF UNITS TOTAL RVS ₁₂	PACIFIC IPA NUMBER x CRVS = OF UNITS TOTAL RVS ₁₃	
LABORATORY TESTS				
URINALYSIS				
AMYLASE	16 x 6 = 96	---	10 x 6 = 60	
HEPATITIS	2 x 14 = 28	---	2 x 14 = 28	
WHITE BLOODCOUNT	---	---	4 x 8 = 32	
THYROID ASSAY	---	---	3 x 5 = 15	
TOTAL RILIRARY	2 x 11 = 22	---	---	
STOOL FOR OCCULT BLOOD	---	---	2 x 12 = 24	
	---	---	2 x 7 = 14	
TOTALS	20 146		23 173	
ARVS _{1j} = $CR \cdot \sum_k (Q_{1jk} \cdot CRVSK) / \sum_k Q_{1jk}$	$146 \times .065 = .475$	0.000	$173 \times .065 = .488$	
(See text for explanation of notations.)				
RADIOLOGICAL EXAMINATIONS				
GALLBLADDER ULTRASOUND				
CHEST FILM	20 x 13.0 = 260.0	---	8 x 13.0 = 104.0	
ABDOMINAL ULTRASOUND	9 x 2.5 = 22.5	---	1 x 2.5 = 2.5	
BARIUM ENEMA	2 x 13.0 = 26.0	---	4 x 13.0 = 52.0	
ABDOMINAL FILM	1 x 27.0 = 27.0	---	2 x 27.0 = 54.0	
	2 x 2.6 = 5.2	---	1 x 2.6 = 2.6	
TOTALS	34 340.7		16 215.1	
ARVS _{1j} = $CR \cdot \sum_k (Q_{1jk} \cdot CRVSK) / \sum_k Q_{1jk}$	$340.7 \times .583 = 5.842$	0.000	$215.1 \times .583 = 7.838$	
(See text for explanation of notations.)				
OTHER DIAGNOSTIC TESTS/EXAMINATIONS				
EKG (CRVS MEDICAL UNITS: M)				
TOTALS	4 x 8 = 32	1 x 8 = 8	---	
	4 32	1 8	---	
	$32 \times .261 = 2.088$	$8 \times .261 = 2.088$	0.000	
ARVS ₁₁ = $CR \cdot \sum_k (Q_{1jk} \cdot CRVSK) / \sum_k Q_{1jk}$				
(See text for explanation of notations.)				

APPENDIX B:

THE 1974 CALIFORNIA RELATIVE VALUE SCALE WEIGHTS

APPENDIX B: THE 1974 CALIFORNIA RELATIVE VALUE SCALE WEIGHTS

PHYSICIAN VISITS

<u>Office Visit Types</u>	<u>New Patient</u>	<u>Established Patient</u>
Minimal	-	2.4 M
Brief	5.9 M ^{1/}	3.5 M
Limited	7.6 M	5.2 M
Intermediate	10.5 M	6.5 M
Extended	-	8.7 M

PROCEDURES FOR SPECIAL ANALYSIS

Amniocentesis:	0.6S	Skin Patch Test	
Pelvic Sonogram:	13.0R	Per test under 5 tests:	0.9M
G.I. Series:	9.1R	Per Test over 5 tests:	0.7M
Cholecystogram:	6.0R	De-sensitization Injection:	2.0M
Dilation and Curettage:	2.7S	Cholecystostomy:	7.4S
Hysterectomy:	10.0S	Cholecystectomy:	8.2S
Myringotomy:	0.35S	Choledochostomy:	10.1S
Caesarean Section:	7.9S		

SURGICAL PROCEDURES:

Biopsy:	0.6S	Colonoscopy, beyond splenic	
Esophagoscopy:	2.1S	flexure:	4.2S
Esophagogastrosopy:	2.5S	Colonoscopy, below splenic	
Esophagogastroduodenoscopy:	2.9S	flexure:	2.9S
Gastrosopy:	2.1S	Proctosigmoidoscopy	0.4S
Endoscopy, small intestine:	RNE ^{2/}	Endometrial Biopsy	0.45S
Laparoscopy	3.8S	Anoscopy	0.25S

^{1/}The designation (M) indicates that the relative value code was derived from the medicine section of the 1974 CRVS. Codes from the section are internally comparable, but cannot be compared directly with codes from CRVS sections for surgery (S), pathology (P), or radiology (R).

^{2/}Rate not established.

APPENDIX B: THE 1974 CALIFORNIA RELATIVE VALUE SCALE WEIGHTS (Continued)

PATHOLOGICAL PROCEDURES (for calculations average weight per pathological procedure) (Continued)

Amylase:	14.0P	Sodium	7.0P
Glutaryl Transpeptidase:	15.0P	Potassium	7.0P
Panel Profile:	30.0P	Chloride:	14.0P
Protine:	12.0P	Magnesium:	14.0P
Glucose, stick test:	5.5P	Urine Pregnancy Test	8.0P
Triglycerides	30.0P	Gravidex (Pregnancy Test	
Monospot	8.0P	Blood)	20.0P
T3	11.0P	Iron Binding Capacity	13.0P
T4	11.0P	Gammaglobulin E, RIA	50.0P
Fasting Chemical Profile	26.0P	Cytopathology	30.0P
Liver Profile	30.0P	Creatinine	10.0P
Lipase	16.0P	Urea nitrogen (BUN)	7.0P
Toxoplasmosis	30.0P	Carbon dioxide (CO ₂)	7.0P
Iron, serum	12.0P	Pentazoiane Lactate:	40.0P
Electrolytes	20.0P	Differential WBC	5.0P
Blood sugar:	7.0P	with buffy coat	8.0P
Sedimentation Rate:	5.0P	Blood Culture:	24.0P
Potassium:	7.0P	Gastric Acid:	7.5P
Blood fecul occult	7.0P	Alkaline Phosphatase:	10.0P
SGOT	8.0P	Bleeding time, Duke:	6.0P
Urinalysis	6.0P	Sickle Cell:	9.0P
Electrophoresis,		Blood Theophyllin level:	40.0P
hemoglobin:	35.0P	Nasal smear, eosinophile:	9.0P
Prothrombin time:	7.0P	IgE:	50.0P
Thromboplastin time	10.0P	IgG, IgA, IgM:	20.0P
Antistreptolysin	12.0P	Gonadotropin, choromic	
PAP Test:	12.0P	quantitative	20.0P
Hemogram, antomated	7.0P	quantitative	70.0P
Blood Type:	7.0P	FTA	24.0P
RH Factor:	7.0P	VDRL	6.0P

APPENDIX C:
STANDARDIZED UTILIZATION UNITS
PER UNIT OF SERVICE

APPENDIX C: STANDARDIZED UTILIZATION UNITS PER UNIT OF SERVICE

Variable Description	Standardized Units
Primary Care office visits (GP, Internists*, Family Practice Physicians, Pediatricians, non-physicians providers):	<u>All Sites</u>
Brief, minimal, or limited	.966
Intermediate	1.697
Extended	2.271
Specialist Office Visits (using conversion factor 1.264)	
Brief, minimal, or limited	1.221
Intermediate	2.145
Extended	2.871
Selected Procedures:	
Amniocentesis	4.527
Pelvic sonograms	7.579
G.I. Series	5.305
Cholecystography	3.498
Skin-patch test (5 tests)	2.624
De-sensitization injections	0.522
Cholecystitis Surgery	64.887
Hysterectomy	75.450
Myringotomy	2.641
Caesarean Section	59.606
Dilation and curettage	20.372
Fiberoptic examination	22.635
DRG Values Per Admission	
Maternity care (vaginal delivery)	153.493
Maternity care (ceasarean section)	234.540
Cholecystitis	259.733
Pediatric Asthma	104.009
Otitis Media	191.424
Uterine Bleeding	224.669
Duodenal Ulcer	386.677

*See text for discussion of relative value weights assigned to visits to internists.

APPENDIX C: STANDARDIZED UTILIZATION UNITS PER UNIT OF SERVICE
(Continued)

Variable Description	Standardized Units
Values Per Inpatient Day	
Maternity care	25.200
Cholecystitis	26.300
Pediatric Asthma	24.600
Otitis Media	27.100
Uterine Bleeding	25.100
Duodenal Ulcer	26.000

DIAGNOSTIC AND PRACTICE SITE SPECIFIC STANDARDIZED UTILIZATION UNITS PER UNIT OF AGGREGATED
CATEGORIES OF SERVICE: PREPAID GROUP PRACTICES

Variable Description and Diagnosis	Site - Specific				
	West PGP	Central PGP	Pacific PGP	Midwest PGP	Atlantic PGP
Laboratory Profiles					
Maternity Care	0.650	0.000*	0.650	0.650	0.650
Uterine Bleeding	0.650	0.650	0.858	0.650	0.650
Pediatric Asthma	0.650	0.650	0.650	0.000	0.650
Duodenal Ulcer	1.061	0.910	0.962	0.650	0.000
Cholecystitis	0.933	0.736	1.300	0.650	1.300
Otitis Media	0.650	0.650	0.000	0.650	1.430
Individual Laboratory Tests					
Maternity Care	0.516	0.523	0.595	0.461	0.585
Uterine Bleeding	0.695	1.333	0.903	1.040	0.725
Pediatric Asthma	1.457	1.452	2.418	0.563	1.300
Duodenal Ulcer	0.485	0.715	0.520	0.455	0.000
Cholecystitis	0.567	0.498	0.000	0.608	0.368
Otitis Media	1.170	0.871	0.000	0.628	1.170
Radiologic Procedures					
Maternity Care	0.000	0.000	1.458	0.000	1.458
Uterine Bleeding	1.458	3.498	7.579	0.000	7.579
Pediatric Asthma	1.458	1.458	1.458	0.000	0.000
Duodenal Ulcer	2.952	3.517	6.219	0.000	0.000
Cholecystitis	4.302	5.610	1.458	7.200	0.000
Otitis Media	0.000	1.458	0.000	1.458	0.000
Other Diagnostic Procedures					
Maternity Care	0.000	0.000	2.597	4.527	2.088
Uterine Bleeding	3.395	0.000	2.088	0.000	3.395
Pediatric Asthma	0.000	0.000	0.000	0.000	0.000
Duodenal Ulcer	2.088	0.000	0.000	0.000	0.000
Cholecystitis	0.000	2.088	2.088	0.000	0.000
Otitis Media	0.000	0.000	0.000	0.000	0.000

*Zero rates indicate that the practice did not utilize any services for the diagnosis listed.

DIAGNOSIS AND PRACTICE SITE SPECIFIC STANDARDIZED UTILIZATION UNITS PER UNIT OF AGGREGATED CATEGORIES OF SERVICE: INDIVIDUAL PRACTICE ASSOCIATION

Variable Description and Diagnosis	Site Specific				
	West IPA	Central IPA	Pacific IPA	Midwest IPA	Atlantic IPA
Laboratory Profiles					
Maternity Care	0.650	0.650	0.650	0.650	0.000
Uterine Bleeding	0.650	0.650	0.823	1.040	0.650
Pediatric Asthma	0.650	0.650	0.000	0.650	0.650
Duodenal Ulcer	1.126	0.780	1.170	1.482	1.430
Cholecystitis	1.235	2.210	1.187	0.946	0.996
Otitis Media	0.650	0.000	0.000	0.650	0.000
Individual Laboratory Tests					
Maternity Care	0.543	0.546	0.803	0.323	0.000
Uterine Bleeding	0.805	1.077	0.692	0.332	0.736
Pediatric Asthma	1.430	1.586	2.600	1.111	0.390
Duodenal Ulcer	0.587	0.450	0.498	0.390	0.552
Cholecystitis	0.455	0.455	0.551	0.340	0.702
Otitis Media	1.083	1.170	0.000	1.170	0.845
Radiologic Procedures					
Maternity Care	4.181	0.000	0.000	0.000	0.000
Uterine Bleeding	0.000	0.000	1.458	1.458	0.000
Pediatric Asthma	1.458	0.000	1.458	1.458	1.458
Duodenal Ulcer	1.698	3.644	2.138	2.833	1.516
Cholecystitis	3.803	6.510	11.258	6.875	4.106
Otitis Media	0.000	0.000	0.000	1.749	1.904
Other Diagnostic Procedures					
Maternity Care	0.170	0.000	2.533	0.000	0.000
Uterine Bleeding	0.000	2.088	3.395	0.000	28.671
Pediatric Asthma	0.000	1.566	0.000	0.000	0.000
Duodenal Ulcer	2.088	0.000	2.088	0.000	2.088
Cholecystitis	4.439	2.088	6.791	3.308	0.000
Otitis Media	0.000	0.000	0.000	2.349	0.000

DIAGNOSIS AND PRACTICE SITE SPECIFIC STANDARDIZED UTILIZATION UNITS PER UNIT OF AGGREGATED CATEGORIES OF SERVICE: FEE FOR SERVICE

Variable Description and Diagnosis	Site Specific			
	West FFS	Central FFS	Pacific FFS	Midwest FFS
Laboratory Profiles				
Maternity Care	0.650	0.671	0.650	0.650
Uterine Bleeding	0.650	0.650	0.914	1.755
Pediatric Asthma	1.050	0.000	0.650	0.000
Duodenal Ulcer	0.650	0.940	1.075	1.652
Cholecystitis	1.170	0.866	1.395	1.264
Otitis Media	0.000	0.000	0.650	0.975
Individual Laboratory Tests				
Maternity Care	0.434	0.413	1.172	0.464
Uterine Bleeding	0.633	0.539	0.650	0.565
Pediatric Asthma	1.560	0.000	1.219	1.885
Duodenal Ulcer	0.740	0.650	0.566	0.431
Cholecystitis	0.528	1.278	1.443	0.427
Otitis Media	1.170	1.170	0.358	1.235
Radiologic Procedures				
Maternity Care	7.579	0.000	1.458	7.579
Uterine Bleeding	1.458	7.579	7.579	3.498
Pediatric Asthma	2.127	1.458	1.458	1.458
Duodenal Ulcer	5.101	3.336	2.818	2.845
Cholecystitis	5.672	5.730	9.021	4.677
Otitis Media	0.000	1.458	0.000	1.458
Other Diagnostic Procedures				
Maternity Care	0.000	0.000	2.088	2.088
Uterine Bleeding	0.000	21.263	3.270	2.524
Pediatric Asthma	1.566	5.220	0.000	0.000
Duodenal Ulcer	0.000	5.533	2.088	2.088
Cholecystitis	0.000	2.088	14.043	3.064
Otitis Media	0.000	2.088	0.000	0.000

APPENDIX D:
AVERAGE ADJUSTED DRG RATES

APPENDIX D: AVERAGE ADJUSTED DRG RATES

<u>DISEASE OR CONDITION</u>	<u>DRG#</u>	<u>AVERAGE OF ADJUSTED RATES</u>
OTITIS MEDIA		
Myringotomy, age 17+	61	962.213
Myringotomy, age 0-16	62	604.233
Otitis Media and URI, age 65+	68	1679.465
Otitis Media and URI, age 18-65	69	1114.539
Otitis Media and URI, age 0-17	70	<u>850.311</u>
	SIMPLE MEAN	1042.152
PEDIATRIC ASTHMA		
Bronchitis and asthma, age 0-17	98	<u>1040.088</u>
	SIMPLE MEAN	1040.088
DUODENAL ULCER		
Major small and large bowel procedures, age 70+	148	6845.654
Major small and large bowel procedures, age 0-69	149	4660.751
Minor small and large bowel procedures, age 70+	152	4122.198
Minor small and large bowel procedures, age 0-69	153	2804.198
Stomach, esophageal, duodenal procedures, age 70+	154	7551.976
Stomach, esophageal, duodenal procedures, age 0-69	155	5405.063
G.I. hemorrhage, age 70+ and/or second dx	174	2812.863
G.I. hemorrhage, age 0-69 w/o dx 2	175	2042.165
Complicated peptic ulcer	176	2301.372
Uncomplicated peptic ulcer, age 70+	177	2207.050

APPENDIX D: AVERAGE ADJUSTED DRG RATES (Continued)

<u>DISEASE OR CONDITION</u>	<u>DRG#</u>	<u>AVERAGE OF ADJUSTED RATES</u>
MATERNITY (C SECTION)		
Caesarean section with dx 2	370	2540.963
Caesarean section w/o dx 2	371	<u>2149.844</u>
	SIMPLE MEAN	2345.404
MATERNITY (VAGINAL)		
Vaginal delivery with complications	372	1487.055
Vaginal delivery w/o complications	373	1292.226
Vaginal delivery with sterilization	374	<u>1825.498</u>
	SIMPLE MEAN	1534.926

APPENDIX E:

ARVS VALUES FOR PRESCRIPTION DRUGS

<u>Diagnosis</u>	<u>Prescription</u>	<u>Number</u>	<u>Cost to Consumer (Source)</u>		<u>RVS WGT</u>	<u>ARVS (4)</u>
Pediatric Asthma	Alupent	92	13.02	(1)	1.86	
	Susphrine	86	26.28	(2)	3.75	
	Total	178				<u>1.94</u>
Uterine Bleeding	Provera	48	53.79	(1)	7.67	
	Motrin	14	32.27	(1)	4.60	
	Total	62				<u>4.88</u>
Duodenal Ulcer	Tagamet	129	46.13	(1)	6.58	
	Mylanta	34	3.54	(3)	0.50	
	Total	163				<u>3.72</u>
Maternity	Prenatal Vitamins	40	14.16	(1)	2.02	
	Benedictin	10	53.79	(1)	7.67	
	Total	50				<u>2.20</u>
Cholecystitis	Donnatal	17	5.38	(1)	0.77	
	Tagamet	10	46.13	(1)	6.58	
	Total	27				<u>2.04</u>
Otitis Media	Amoxicillin	135	3.24	(1)	0.46	
	Bactrim	38	7.01	(2)	1.00	
	Total	173				<u>0.40</u>

Notes:

- (1) Cost to pharmacist obtained from HCFA/DHHS MAC study.
- (2) Cost to pharmacist obtained from IMS America, Inc. as not available from HCFA/DHHS.
- (3) Cost to consumer obtained from representative pharmacists since this is an over-the-counter drug, and not available from other sources.
- (4) ARVS is computed as shown in Appendix A with a conversion factor (CR) of 0.70.

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